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NEW ZEALAND
JOURNAL OF

Agriculture

APRIL - 1952

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Cooper News

FARM BULLETIN published by COOPER, McDOUGALL & ROBERTSON (N.Z.) LTD.
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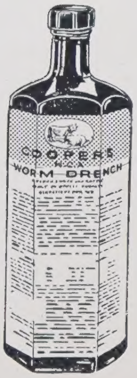
No. 23 PUBLISHED EVERY SECOND MONTH April, 1952

EFFECTIVE WORM DRENCHES



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Minister of Agriculture.

This Month's Cover

A pack team consisting of 8 mules following the tail end of the drive on one of New Zealand's remote high-country stations is the subject of this month's cover. It was prepared from a colour print by Perry Photographer of a photograph taken by National Publicity Studios on Bluff Station in inland Marlborough. Bluff Station, which covers a large part of the Kaikoura Range, was abandoned after being devastated by fire during the First World War. Restoration, which has included the killing of large numbers of rabbits, was begun in 1920, since when the land has been painstakingly restored and restocked.

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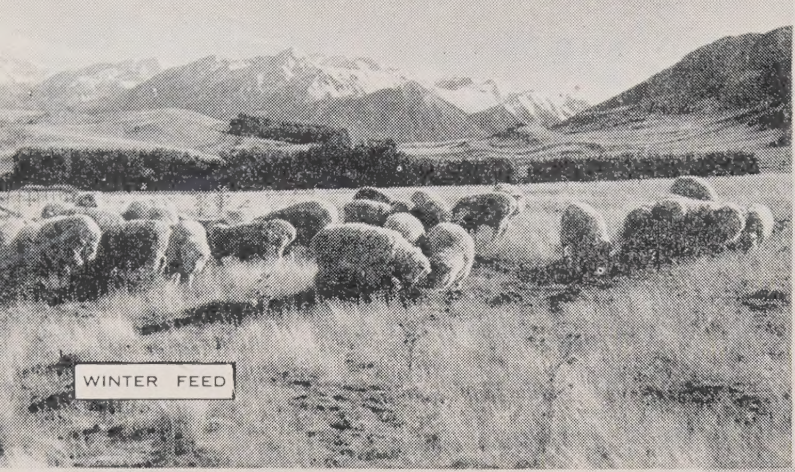
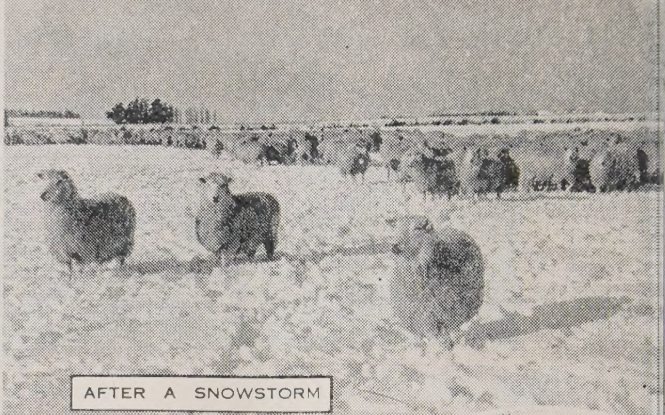
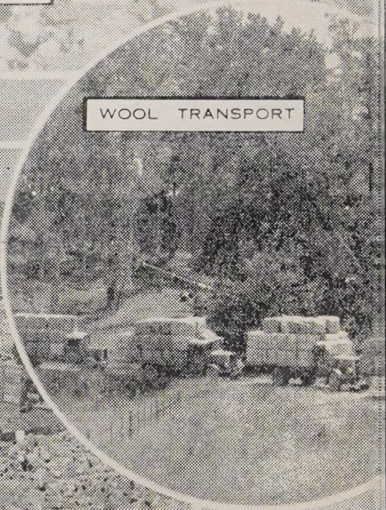
HIGH-COUNTRY FARMING



WINTER FEED

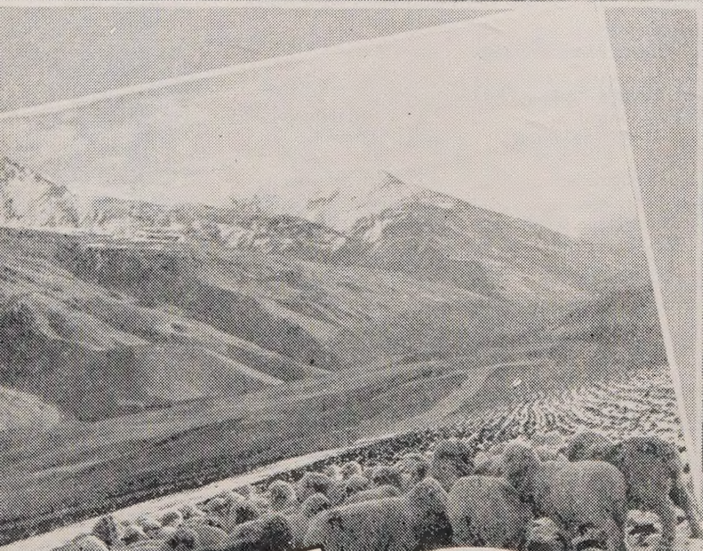


AFTER A SNOWSTORM



WOOL TRANSPORT

SALE DAY



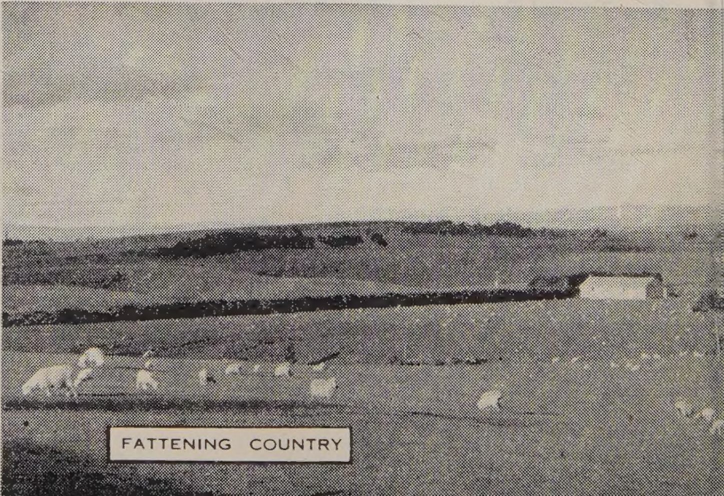
ON WINTER COUNTRY

CORRIEDALES

The area of New Zealand under occupation is 43 million acres, of which 23 million acres is unimproved land, the greater part being hill country. Extensive grazing runs on tussock and surface-sown high country provide the sheep from which lowland farmers draw breeding ewes for fat lamb raising and store sheep and lambs for fattening.

[Photographs by "New Zealand Farmer", E. A. Phillips, Green and Hahn Photography Ltd., Sparrow Industrial Pictures Ltd., "Weekly News", and National Publicity Studios.

MIGRATION TO LOWLANDS



FATTENING COUNTRY

The International Materials Conference

SINCE the end of the Second World War, and the change-over from the making of munitions to civilian goods, the world's capacity for manufacturing production has outstripped the supply of raw materials. The rapid increase in industrial production in the United States of America and in Western Europe alone in 1950 would probably have caused a big drain on supplies, but recently these shortages have become aggravated by the demand for enormous quantities of raw materials for defence purposes. Though many countries, in attempts to control demand, imposed restrictions on the use of scarce commodities, it became obvious in 1950 that international control was necessary if equitable distribution of world supplies were to be achieved and the forcing of prices up to exorbitant levels prevented.

To meet this situation the Governments of the United States, Britain, and France set out to establish international machinery to control scarce raw materials entering into world trade. The outcome was the setting up of the International Materials Conference, with headquarters at Washington, U.S.A.

The Conference was organised on the basis of a Central Group with ten members—Australia, Brazil, Canada, France, India, Italy, Britain, and the United States and representatives of the Organisation of American States and of the Organisation for European Economic Co-operation. The main function of the Central Group is to maintain a constant watch on all raw materials and where necessary to establish Commodity Committees. These Committees usually comprise representatives of about a dozen of the leading producing and consuming countries concerned in the commodity to be dealt with, due regard being had to geographical coverage.

Up to the present time the following Commodity Committees have been set up: Sulphur, Pulp-Paper, Cotton-Cotton Linters, Wool, Manganese-Nickel-Cobalt, Tungsten-Molybdenum, and Copper-Lead-Zinc. Altogether 27 countries now participate in the work of the Committees. New Zealand is represented on the Sulphur Committee and the Wool Committee. Each Committee lays down its own procedure and makes its own decisions; the Central Group has no overriding authority.

The first task to be undertaken by a Committee is to make a survey of world requirements and supply. Information is collected and distributed on such matters as methods of conservation, the use of substitutes, and steps to increase the supply. In the case of Cotton-Cotton Linters this has proved sufficient. This Committee was set up because of an acute world shortage in 1950, but the 1951 crop improved the world situation to such an extent that international action was not thought to be necessary, although the situation is to be reviewed from time to time. The Wool Committee decided that it was impossible to obtain agreement on any distribution plan at present, but also decided to keep the situation under review.

In certain cases Committees have found it necessary to draw up allocation schedules. As the sole power of each Committee is to make recommendations to the various Governments, each allocation schedule must perforce be so reasonable that it would be voluntarily accepted; and this is in fact what invariably happens.

As New Zealand is vitally concerned with sulphur, which is used in superphosphate manufacture as well as in most other chemical manufacturing processes, a brief outline of the operations of the Sulphur Committee may be of interest.

This Committee first made a preliminary survey of world production and consumption, and at the same time instituted a system of questionnaires for completion at the end of each quarter by all participating countries. It then made an interim allocation for the first quarter of 1951, under which New Zealand obtained 13,125 tons of sulphur. Completion of the questionnaires initially caused difficulty in some countries, but as the year 1951 progressed the data gathered by this means became more complete and reliable. A Sub-committee on Distribution, which later came to include all members of the Committee, was then set up to prepare an allocation formula. The formula adopted was amended slightly during the year. All countries were invited to submit their cases both orally and in writing, and most countries did so, before each quarterly allocation was made.

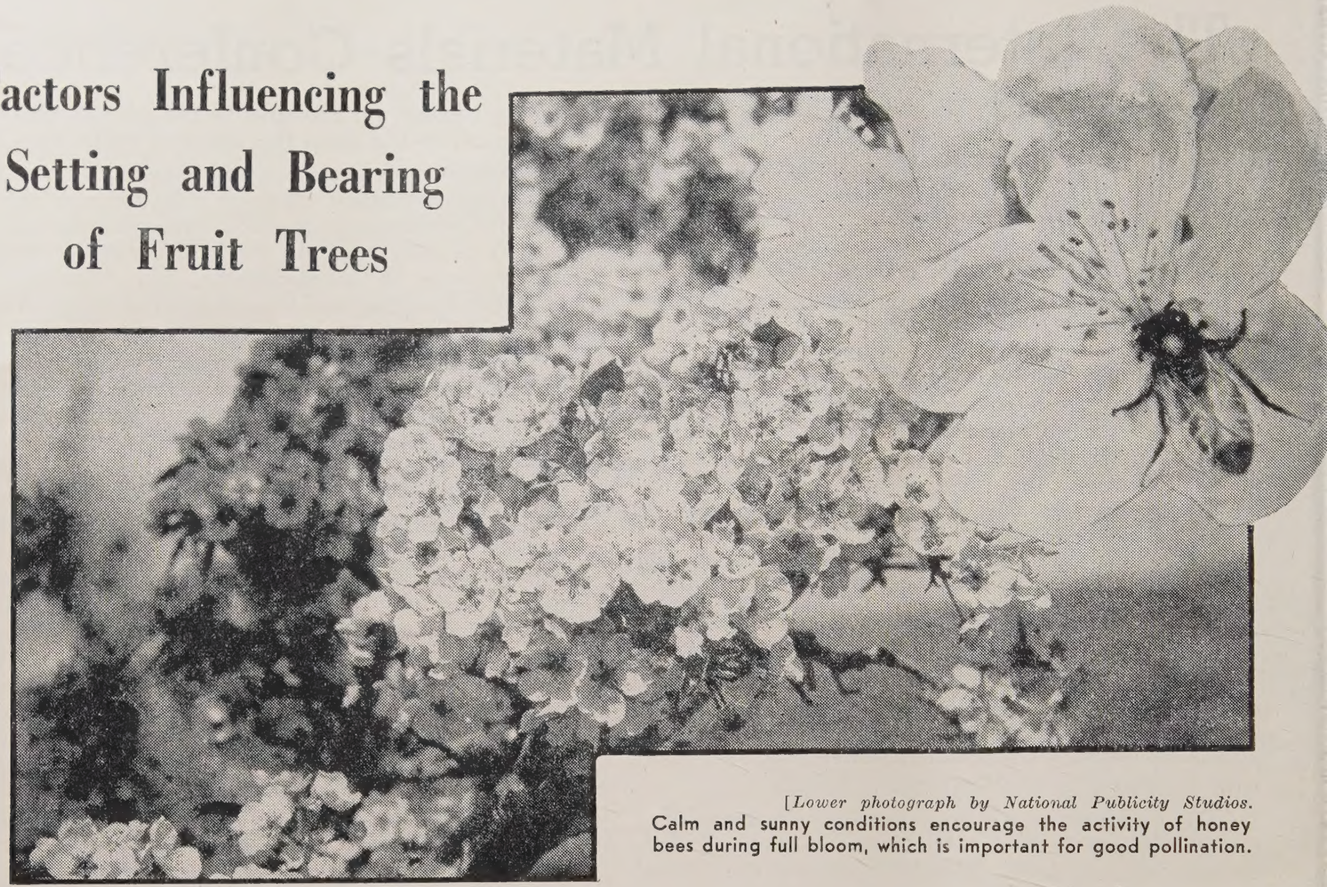
Toward the end of 1951 the question of the formula was reopened, and after much discussion and after several other proposals had been rejected, a working party comprising representatives of the U.S.A., Belgium, South Africa, Germany, and Switzerland drew up a new formula which was finally adopted for the first half of 1952, and was later accepted by all Governments, some of them accepting with certain reservations.

The truly international atmosphere in the Sulphur Committee, under its Belgian chairman, M. Marcel Feron, is well illustrated by the stands taken by the various representatives on the motion to adopt the 1952 plan of distribution. New Zealand, Canada, and South Africa were among nine countries which recommended to their Governments that the plan be accepted. The United Kingdom, India, and three other countries passed the plan to their Governments without recommendation; Australia and Sweden could not recommend acceptance, but submitted the plan to their Governments for consideration.

The International Materials Conference provides a striking illustration of how the countries of the free world, working together in a spirit of true democracy, can and do help each other. The burden imposed by crucial shortages is being shared, so that each country is dealt with fairly and is enabled as far as is humanly possible to meet defence requirements with the minimum dislocation of their civilian economies.

K. J. HOLYOAKE, Minister of Agriculture.

Factors Influencing the Setting and Bearing of Fruit Trees



[*Lower photograph by National Publicity Studios.*

Calm and sunny conditions encourage the activity of honey bees during full bloom, which is important for good pollination.

MAINTENANCE of consistent and heavy crops of fruit is essential to success in commercial fruit growing. Orchardists whose trees do not always crop consistently attribute this to various causes, including in particular the weather at the time of fruit setting. Poor or irregular fruit setting and bearing may be caused by many factors other than climatic conditions, and in this article T. Conway, Horticultural Instructor, Department of Agriculture, Hastings, describes those which, individually or collectively, may be the cause of disappointing crops.

FRUIT SETTING is a very complex process, and present production methods tend to aggravate the position, as in many cases they are contrary to Nature. For instance, a limited number of varieties best suited to markets and modern cultural operations is usually selected and planted in fairly large blocks without special consideration of pollination; in later years, when the mistake is appreciated, difficulty is found in correcting it without considerable replanting or reworking of trees to provide pollinating varieties.

When a block of fruit trees has been planted the owner has an understandable desire to see the trees bear fruit in commercial quantities as soon as possible. However, Nature usually declines to be hurried, but under intensive culture and by the use of modern knowledge the period during which the trees are unproductive can be shortened considerably. In general, the new orchardist must exercise patience, as the time of bearing is related largely to the kind and variety of tree, the root stock, the soil, and the need to build a strong framework capable of supporting heavy crops. Overburdening a tree with crops too early may seriously curtail its development and restrict its future bearing capacity.

Fruit crops sometimes fluctuate pronouncedly from season to season over whole districts or between orchards within districts. When variations occur within districts the poor crops are often most evident in varieties which tend toward biennial bearing. The over-all crop in such an orchard may not be affected unduly because, while one or two varieties give poor results in any one year, the other varieties produce so well that weaknesses are largely offset. Nevertheless, retention of varieties which produce irregular crops is unwise; either they should be replaced or measures should be taken to regulate their cropping habits.

A factor such as the weather may cause a severe setback to relatively stable production from orchards. In such circumstances not only the individual orchardist but also the market supply in general can be affected seriously.

Bearing Life of Trees

The time of beginning to bear and the age at which full production is reached normally vary considerably between kinds and varieties of fruit trees. Peaches and plums will generally crop very much earlier after planting than other kinds, such as apples and pears, and some varieties begin bearing much sooner than others. Precocity in cropping is not always an advantage, as it may retard growth to an undesirable extent.

Normally apples can be expected to begin bearing reasonable crops 6 to 8 years from the time of planting, pears 8 to 12 years, peaches 3 to 5 years, apricots 4 to 5 years, cherries 5 to 7 years, Japanese plums 4 to 5 years, English plums 5 to 7 years, quinces 5 to 6 years, Meyer lemons 3 to 4 years, and other citrus trees 6 to 10 years.

General management and local conditions have a considerable influence on the time of bearing. Fruit trees normally reach maximum production at about the following ages: Apples 15 years, pears 18 years, peaches 8 years, plums 10 years, apricots 10 years, quinces 14 years, Meyer lemons 12 years, and other citrus fruits 18 years.

Neglect, disease, and age gradually have a serious effect on the cropping of fruit trees, and there are limits beyond which economic production cannot be maintained. Therefore regular replacement of exhausted trees is necessary even in the best-managed orchards.

Even under good management maintaining fruit trees in full commercial production becomes increasingly difficult as they progress beyond the following approximate ages: Apples 40 years, pears 50 years, peaches 15 years, plums 30 years, apricots 25 years, cherries 30 years, quinces 30 years, and citrus fruits 35 years. However, much depends on the root stocks used, the soil conditions, and the incidence of disease.

The weather at the time of blossoming and fruit setting plays a very important part in the cropping of fruit trees; it is, perhaps, the most important single factor. If a reasonable period of warm, sunny, calm weather occurs during this critical period, fruit set should be satisfactory unless some other restricting factor is present. The benefit of shelter in this respect must not be overlooked.

Weather has an important influence on two vital aspects of pollination: It controls the flight and activity of bees and other pollinating insects, and it affects fertilisation of the blossom. For bees to work effectively the weather must be favourable; they are more active in fairly high temperatures (60 to 70 degrees F.) and when conditions are sunny with an absence of high winds. Excessive humidity caused by relatively high temperatures after heavy rain, or conversely very cold conditions, prevents the pollen from maturing and drying, thus making it unsuitable for bees and other insects to carry from blossom to blossom. In rough, windy, wet weather much of the pollen can be washed away from the open blossoms and, though sunny conditions may follow, setting of fruit is often poor.

A very poor setting sometimes results when the blossom opens under favourable conditions followed immediately by a prolonged cold period. In such circumstances a severe drop of the young fruits can be expected during the natural drop period.

If the root systems of the trees are healthy and soil conditions are satisfactory, root activity will begin a short time before blossoming. New root growth may be quite considerable if the soil is reasonably warm, moist, and aerated, with the result that abundant moisture is transmitted to the flowers and leaves as they appear. Such conditions are good for setting of fruit.

On the other hand, if the soil remains persistently cold and over-wet, though atmospheric conditions may be relatively satisfactory, leaf and blossom activity will occur from the stored-up energy in the trees without corresponding root activity. Unless the leeway is made up rapidly by activity in the root system, leaves and fruit buds will not be supplied with sufficient moisture and soil elements, particularly nitrogen. Under such conditions dropping of fruitlets may be heavy.

Excessive rain at the time of blossoming and fruit setting may restrict the availability of a high proportion of the soil nitrogen, and a temporary nitrogen starvation could result at a time when ample nitrogen is of first importance to the trees.

The climate of a locality is sometimes the factor deciding what trees can be grown or cropped successfully. Only poor results can be expected if attempts are made to grow fruits in an environment unsuited to them. For instance, successful commercial citrus plantings are possible only in the warmer northern areas of New Zealand, whereas raspberries can be highly productive in the cooler districts but a disappointment in the Auckland district. On the other hand, a wider range of conditions will suit some fruits, including apples, pears, and peaches, though some varieties are successful in certain localities and not in others. Therefore it has become the practice to recommend certain varieties as being the most successful in specified localities or districts.

Frost Damage

Late frosts during blossoming of fruit trees in spring are often responsible for extensive crop failures, particularly in peaches, plums, apricots, and nectarines, which flower earlier in spring than do pip and berry fruits. The extent of the damage will vary with the severity of the frost and may range from immediate destruction and dropping of the fruit down to distortion and severe russeting. Some light frosts may cause only small losses, tending to thin the fruit and so save thinning costs later.

When only minor damage to apples and pears is caused by frost the fruit frequently remains on the trees until maturity, but will show signs of calyx distortion and fairly severe russeting. The damage to stone fruit is generally more severe; the fruitlets, if not destroyed outright, may develop to marble size, but eventually drop from the trees because of damage to the kernel.

If fruitlets drop from the trees some time after a frost has occurred, the damage to the fruit at the time of the frost has been confined to the sex organs of the flowers or to the young kernels of the smaller fruitlets. If these are cross-sectioned, a brown discoloration of the young kernels of stone fruit may be observed; in apples and pears the discoloration occurs right down to the ovules, from which the seeds are formed.

The liability of blossoms to damage by low temperatures generally increases with their further development after the first spring movement. At tight cluster a temperature of 22 degrees F. may sometimes be withstood without undue loss, at late pink 25 to 26 degrees may damage the blossoms severely, and at full bloom a temperature of 27 degrees may almost ruin the crop. A series of temperatures near these points can have a cumulative effect with disastrous results. One damaging frost at full bloom may not destroy the whole crop, as the later-developing buds may not be damaged and may set satisfactorily if another frost does not occur.

Winter injury of dormant buds often occurs overseas, but, fortunately, temperatures are rarely low enough in New Zealand to cause such damage.

A considerable degree of frost protection can be given to fruit trees by oil burners placed at intervals throughout the orchard and lit when low temperatures are likely to cause harm. The use of such burners has been extended greatly in recent years.

Root Stocks

The productivity and vigour of a fruit tree are much influenced by the root stock on which it is propagated. The stock also influences the time at which a tree begins to bear profitable crops after being planted; trees on vigorous stocks begin bearing later than those on weaker stocks and therefore are later in coming into full production, but a strong root stock eventually will produce a tree of bigger framework and capable of carrying heavier crops than will a weaker stock.

Best results can be achieved only by the choice of a root stock to suit the variety, soil type, and location, as some stocks perform better under specific conditions.

[*Sparrow Industrial Pictures Ltd. photo.*

An apple tree producing a heavy crop and developing ample new growth at the same time. A balance of good crops and new growth is essential to the continuance of successful production.

The use of intermediate stocks on some fruit trees, particularly citrus, may affect the quality as well as the production of the fruit. Propagation of trees with intermediate stocks involves a method of double budding or grafting in which a variety providing certain influences is placed on the original stock, followed by final working with the desired variety.

Soil Type

Satisfactory fruit setting and bearing depend essentially on the suitability of the soil type for the kind of fruit. Good-quality, well-drained, and friable soils greatly assist proper functioning of the root systems, and this has a very important bearing on the success of fruit production. Good physical structure and humus content of soils are essential. Heavy clay soils of poor physical structure may cause rapid deterioration or poor functioning of the root systems, which is detrimental to the health of the trees and seriously curtails their cropping capacity.

In some districts or localities the soil may be best suited to one or more kinds of fruits, and growers need to know the fruits their soils are capable of producing satisfactorily. In general, citrus fruits do best on the lighter soils and peaches, nectarines, and apricots prefer deep, friable, well-drained soils. Pears and quinces grow better on the heavier soils and can stand more soil moisture without detrimental effects than can citrus or stone fruits. Apples and plums show a wide tolerance for soils, but grow better on the heavier types. Disappointment is sometimes the result of insistence on trying to grow fruits which are unsuited to local conditions.

Drainage

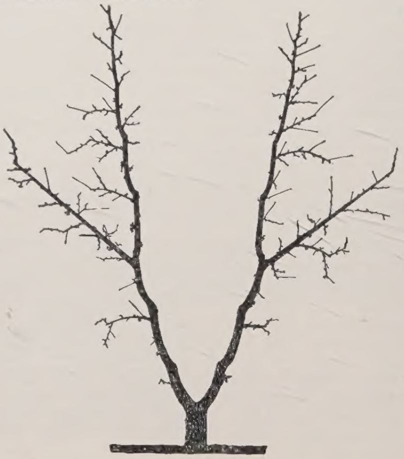
Many New Zealand orchard soils are reasonably well drained as a result of either the natural fall of the land or the friable and free-draining texture of the topsoil and subsoil and have little need of tile or other artificial drainage. This is one of the factors influencing selection of land for fruit growing. The retentive nature of much of the Auckland and Nelson clay subsoils presents its own drainage problems.

However, in many orchards drainage cannot cope efficiently with the heavy rains of autumn, winter, and early spring. Under such conditions root activity during autumn and early spring is restricted severely through lack of oxygen at the rooting area. The main damage is to the small feeding roots which begin to develop in spring. These fine roots are very important to the trees, and any breakdown of or interference with their proper functioning causes a severe check to the trees at a critical time. The buds may begin to burst open in spring and then wilt and die or become stagnant because root action is insufficient to maintain growth as the demand increases.

Drainage, either natural or by tiles, must be adequate to prevent over-saturation of the soil at all times, but particularly in spring. Good drainage also allows the soil to warm satisfactorily, whereas over-saturated soil tends to remain very cold and retards spring development of the trees.

If the soil remains over-saturated for long periods, the roots in the lower strata of the soil become weakened and die, leaving the trees dependent on the roots closer to the surface for survival. If dry conditions follow, the root systems cannot maintain the top growth and the fruit fails to develop properly or may drop from the trees. Furthermore, trees debilitated by lack of drainage over long periods cannot set or carry satisfactory crops, as dieback occurs and lack of growth and foliage become severely restricting factors.

Some kinds of fruit trees are more tolerant of inefficient drainage than are others. Quinces and pears are in this category, but peaches, nectarines, and apricots must have particularly well-drained conditions.



A sketch of part of an apple tree showing distinct, well-spaced limbs allowing for good distribution of fruiting wood.

Cultivation

Care needs to be exercised during spring cultivation, as damage by implements to roots, both large and small, may cause a severe reduction in the supply of moisture and nutrients to the trees at the vital fruit-set period. Some of the very fine roots are close to the surface, even down the middle of a row or bay, and deep cultivation, particularly by ploughs and disc harrows, can cause damage which will, at least temporarily, cut off supplies to the trees. This is usually more evident in soils which are rather shallow or have been mulched, irrigated, or highly fertilised, as in those conditions a large proportion of the fine roots are close to the surface.

An orchard with a dry, friable soil in loose cultivated condition, or one which is carrying tall and extensive weed or plant growth, is more liable to frost damage by light or marginal frosts in spring than is one with a fairly firm and moist soil which is free from weeds. A firm, moist, weed-free soil may give protection against a frost of 2 or 3 degrees, and this aspect is worth consideration when spring cultivation is being undertaken. The ideal would be to cultivate the soil to a reasonably fine tilth as early as conditions allow and then firm it with a Cambridge roller to draw the soil moisture close to the surface. Cultivation can then be continued after danger from frost has passed. Such a system may not be necessary or possible, however, on heavy clay soils.

Pruning

Unless pruning achieves proper balance of fruiting and non-fruiting wood, biennial bearing or partial crop failures may result. New fruiting wood must be encouraged in the tree so that the fruit is borne mainly on reasonably young growth. This entails cutting away much of the older fruiting wood which has become exhausted and cannot be relied on to crop regularly. Fruit buds on the younger growth are healthier and stronger, and ample replacement of old wood and maintenance of young fruiting wood in the trees can contribute much to regularity of cropping.

Proper development of fruit buds is associated in a high degree with the provision of ample light and air throughout the trees. Training and pruning of trees to facilitate penetration of light is important to the proper development of the buds. Overcrowded trees bear mostly on the outer surface and this restricts their bearing capacity.

To foster regular cropping trees must be kept in moderately strong growth once the bearing habit has become established. At the same time the balance between fruit-producing wood and new growth must be regulated to maintain stable cropping and good health in the trees.

Fairly severe pruning of old and debilitated trees often stimulates them into much-improved growth and fruit bearing.

Heavy thinning of fruit spurs over a period of years results in better lateral growth and new fruiting wood of better type for consistent cropping. Very often insufficient detailed pruning is attempted, with the result that too much old wood and too many spurs are left on the trees.

Excessive pruning causes undue stimulation of the trees into vegetative growth at the expense of fruiting. Lack of pruning retards the development of new growth and usually results in an excess of weak buds which will not set fruit.

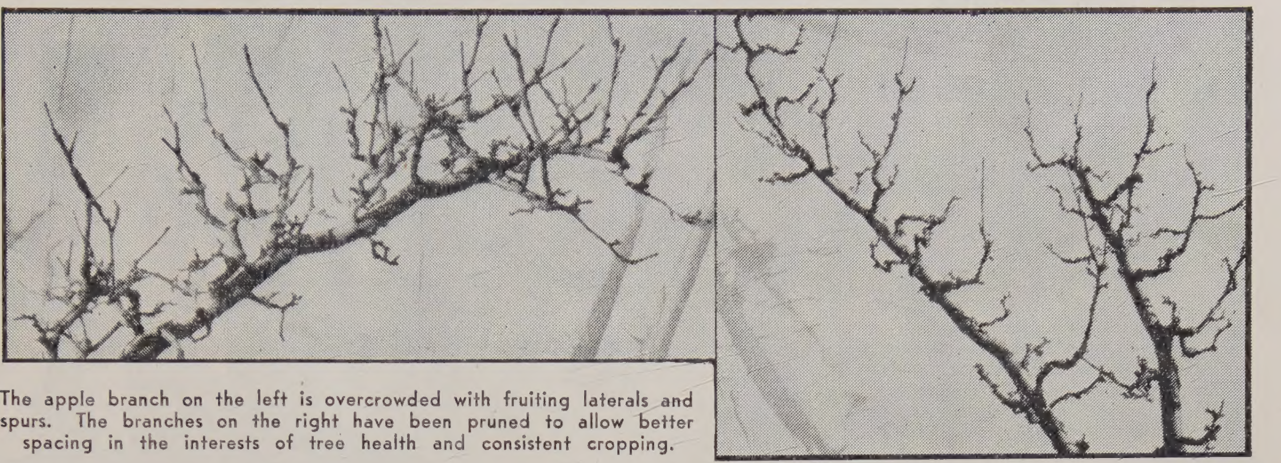
Fairly heavy spur pruning when a heavy crop is expected is claimed to offset the tendency to biennial bearing by reducing the fruit buds and spurs and preventing the trees from exhausting themselves by overcropping.

For best results the relation between fertiliser application and pruning must be close. Heavy pruning and heavy application of nitrogenous fertiliser can result in excessive vigour at the expense of fruiting, whereas light pruning without fertilising may be followed by heavy cropping requiring extensive thinning to produce fruit of good size. An intermediate course should be followed.

Excessive pruning of younger trees delays fruit bearing. This tends to upset the balance between root and top growth, and some years may elapse before adjustment has taken place. Vigorous trees are best pruned lightly to encourage and maintain fruitfulness.

Biennial Bearing

Kinds and varieties of fruit trees differ considerably in form, type of fruiting wood, and cropping habits. Some varieties, particularly of apples, naturally tend to bear well in one season and to carry a poor crop in the following season. This biennial bearing is the cause of many otherwise-good varieties losing popularity.



The apple branch on the left is overcrowded with fruiting laterals and spurs. The branches on the right have been pruned to allow better spacing in the interests of tree health and consistent cropping.

Unless some relief is given in a year of heavy cropping by blossom or fruit thinning, overcropping may occur and development of fruit buds for the following season will be affected seriously. At this point the biennial habit of fruit trees is initially fostered. Care must be exercised in the management of the trees to prevent overcropping in any year.

The tendency toward biennial bearing is most pronounced in some of the spur-bearing varieties, such as Dunns, Ballarat, and Statesman apples and Winter Nelis pears, whereas the more lateral-bearing varieties are more consistent in their production. Therefore the aim should be to prune biennial-bearing trees to encourage the formation of laterals on which to bear their fruit. A correct balance between foliage, fruit spurs, and new fruiting wood is a big factor in maintaining regular crops of these varieties.

The early development of vigorous and ample foliage in spring is important to assure good crops the following year, as the leaves perform the special function of starch or carbohydrate manufacture. Generally in a year of heavy crop the tree produces smaller leaves than when carrying a light crop, and such foliage is less efficient in producing the fruit buds for the subsequent crop. The proportion of foliage to fruit is important in the production of the current season's crop, a fairly high relationship being desirable for good results.

Any variety may be thrown, at least temporarily, into alternate bearing by some physical upset to the trees, such as total loss of crop because of frost damage or severe fireblight during blossoming, by waterlogging caused by excessive rain, or perhaps by failure to prune trees.

Pollination

The relation between fruit setting and the formation of properly developed and viable seed in the fruit is important. Pollination must be effective to assure good crops. Though exceptions are numerous, usually only blossoms which have been fertilised set fruit that will remain on the tree to maturity, as growth of the fruit depends on satisfactory seed development. Lack of satisfactory pollination is often the cause of poor setting of some fruits, particularly pears, sweet cherries, plums, and apples.

Unless pollination is completed, the small fruits, which may appear to have set, will not develop and will fall from the tree shortly after blossoming. Pollination provides for the ovules of the flower being fertilised by the nuclei from the pollen grains. For this purpose the pollen grains must be deposited on the stigma, where they will germinate. Pollen of fruit trees is transferred by bees and other insects. The stigma is coated with a sticky material which holds the grains and allows them to germinate and put out a germ tube which penetrates the style. The nuclei necessary for fertilisation pass down this tube to the ovules.

Some varieties of fruits are self sterile and require cross-pollination with other varieties of the same kind. Other varieties are self fertile and do not require cross-pollination; they include the great majority of peaches and nectarines, and sour cherries, large areas of single varieties of which can be planted.

Some varieties cannot be self pollinated because the flowers are imperfectly formed, prohibiting normal fertilisation. This difficulty is experienced with strawberries because the flowers of some varieties are pistillate. The pollen produced by some kinds of fruiting plants is sterile, which prevents their being of any value in pollination, but these varieties usually are very receptive to the pollen of other compatible varieties, and where they are associated with them good crops can be set.

If self-sterile non-compatible varieties are interplanted, crops will be poor, particularly of pears, cherries, plums, and apples.

An apple tree which was badly pruned and is too dense to allow proper development of fruit buds.

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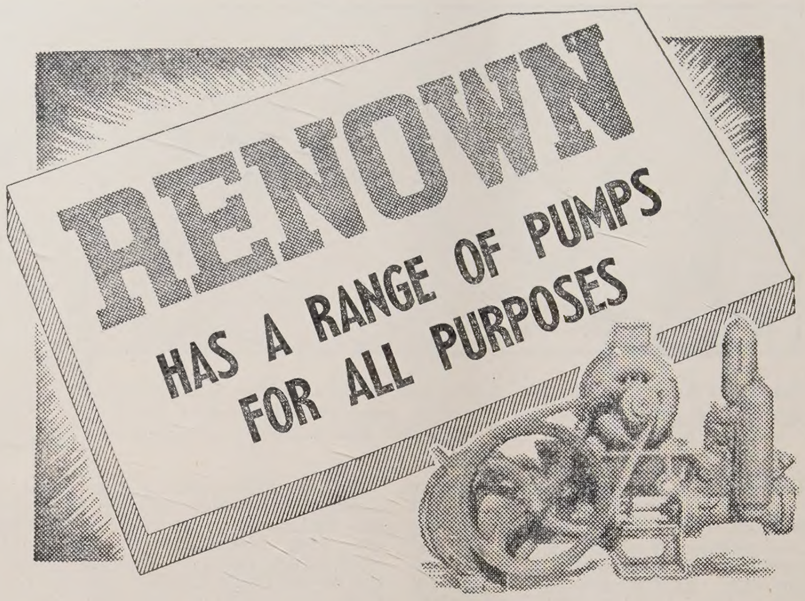

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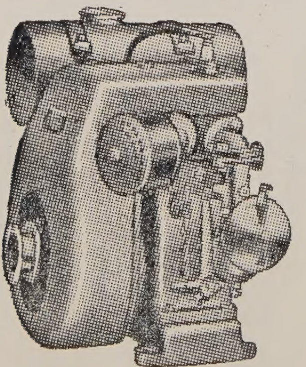

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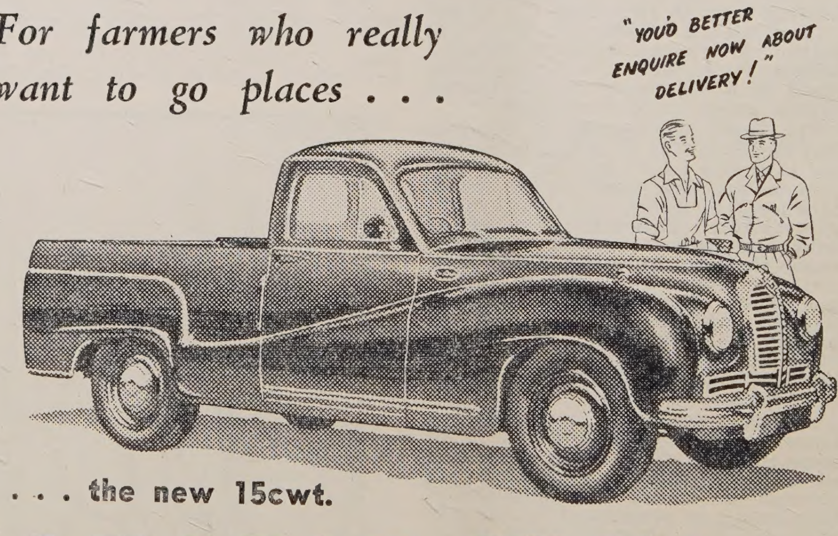
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[*R. Steele photo.*

To ensure cross-pollination and satisfactory setting of fruit it is advisable to plant different varieties of the same kind of fruit which flower at the same time.

Almost all Japanese plums are cross-compatible, provided the flowering periods coincide, though in some exceptions the choice of compatible varieties as pollinators is limited. Some varieties are relatively self fruitful.

Even varieties of fruits which are considered self fertile often set a better crop of fruit if provision is made for cross-pollination. Such provision is a good form of insurance.

In the so-called self-sterile varieties the pollen is not effective on flowers of the same variety and they will not produce seed and carry their fruit properly unless they are cross-pollinated with a suitable variety. The pollen of self-sterile varieties may function satisfactorily on the flowers of other varieties.

No cultivated variety of sweet cherry sets fruit with its own pollen, so they must be cross-pollinated with a compatible variety. Much investigation has been carried out to separate sweet cherry varieties into suitable cross-pollinating groups. Varieties within these groups will not pollinate each other, and plantings must be arranged with varieties from each group closely associated to assure satisfactory setting. When data are complete and available much will be possible to avoid crop failures with cherries.

An attempt is being made at the John Innes Horticultural Institution, England, to breed self-fertile varieties of fruit, but this is a very slow process and many years will elapse before these varieties become available commercially.

Planting a large block of one variety is unwise unless its self fertility is certain. It is preferable to intersperse the varieties at regular intervals. No rule can be laid down, but varieties should perhaps be changed every third row. Some authorities specify that a pollinating variety should be placed at every third tree in every third row as a minimum requirement. However, if an orchard is unduly mixed, difficulties arise because of differences in spraying requirements and harvesting dates of the varieties.

The effectiveness of cross-pollination can be ascertained by hanging flowering laterals from other varieties which flower at the same time in jars of water fairly high up in the trees. Results can then be checked with untreated trees and data secured about both the need for pollination and the compatibility of the varieties tried. If results are satisfactory, permanent pollinators can be budded or grafted on to the trees.

A good pollinator must provide pollen that will germinate well, it must blossom at the same time as the variety to be pollinated, and the varieties must be compatible.

Though English and Japanese plums are not usually compatible, some English plums will pollinate certain Japanese varieties. Some varieties of grapes require cross-pollination.

Work of Bees

The work of the honey bee is the most important factor in the transference of pollen from blossom to blossom for the fertilisation of deciduous fruits. Wind does not assist in the pollination of most deciduous fruits. Other insects are also believed to assist in pollination, but only to a minor extent compared with honey bees.

Sprays which are poisonous or repellent to bees should not be applied during blossoming, but should be delayed until a stage of blossom fall when there is no danger to the bees. Heavy mortality to bees can be caused by careless spraying, and as a safeguard to the beekeeping industry a regulation under the Apiaries Act prohibits the use of sprays poisonous to bees until almost all the blossoms have fallen from the trees.

A subsequent article by D. Roberts, Apiary Instructor, Department of Agriculture, Auckland, will deal with the use of honey bees in the pollination of orchard fruits.

Soil Nutrients

Nutritional requirements of trees setting fruit are rather complicated. The first growth movement in the tree in spring depends on the nutrients stored in the tree parts before dormancy was reached in the previous season, but it is important that ample nutrients, particularly nitrogen, be available in the soil to maintain development of this growth satisfactorily during the vital blossoming and fruit-set period. Soil conditions require to be as near perfect as possible at this period, with a good relation between soil moisture, temperature, and nutrients. A deficiency of nitrogen at this time is likely to cause undue dropping of fruitlets. With the development of early-spring growth nitrogen is utilised in fairly large amounts, resulting in a heavy draw on available supplies. If soil conditions and root activity are not satisfactory, the supply to the trees is restricted, though ample nitrogen may be available.

Trees affected by a nitrogen shortage may bloom quite normally, but will not set fruit properly. The young fruits turn yellow or light green soon after petal fall and are quickly shed from the trees. In stoned fruit this usually results in an excessive drop at the beginning of the pit-hardening stage. If nitrogenous fertilisers are used, they must be applied a short time before the flowers begin to open.

The activity of certain micro-organisms in the soil has an important bearing on the supply of nitrogen. If soil conditions are unsatisfactory, the micro-organisms cannot convert nitrogenous matter in the soil to a suitable condition for assimilation by the roots. In these circumstances the addition of nitrogen in the form of nitrates will overcome any shortage which may be caused. The stimulating effect of nitrogen on the roots gives them greater foraging power under dry conditions, as well as sponsoring their early development.

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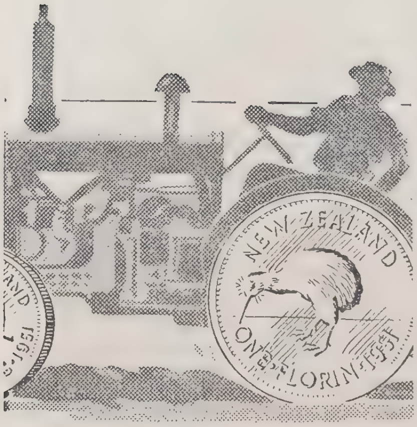

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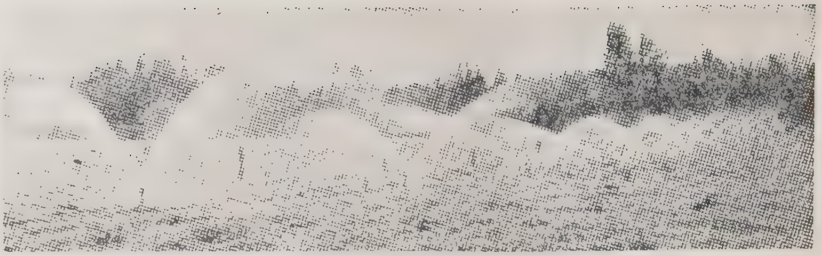

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A plum branch before and after being thinned. Thinning of fruit has an important bearing on regularity of cropping.

Nitrogen is preferably applied in spring, whereas applications of phosphates and potash are better made in late autumn or winter, but a correct balance of these nutrients is essential at all times. Any excess of growth arising from too liberal use of fertilisers may restrict the development of fruit buds, and lack of plant nutrients can result in weak blossom buds and poor general tree health.

The fruit buds of most deciduous fruits are formed during the preceding season, and if soil nutrients and general growing conditions are not satisfactory during this period, the result will be a light crop in the following year.

Thinning of Surplus Fruits

As blossoming of fruit trees is completed, all blossoms which have not been fertilised fall off the trees. The small fruits which remain increase slightly in size until late November or early December, when in apples and pears a natural drop of surplus or weaker fruits occurs; for stoned fruit this period is about the end of October to early November. This is a normal procedure and is referred to as the "natural drop". Except in "off-bearing" years following some climatic upset, usually more fruit is left on the trees than is necessary to provide a satisfactory crop. Only a very small proportion of the mass of original blossoms needs to set properly to provide a good crop to be carried to maturity.

The period of growth up to about early December is vital in the life of fruit trees, as new shoot growth, fruit setting, root growth, and bud development are all occurring during a relatively short time. That points to the need for thinning fruit as early as possible, but normally thinning should take place only after the natural drop, for all calculations may be upset if further natural dropping occurs. If thinning is neglected, not only will production from the trees be affected in the following season, but the fruit size in the current season will be small.

Though blossom thinning is known to be more beneficial in ensuring a satisfactory crop in the following season than is fruitlet thinning, not only is it a tedious and difficult operation, but it may result in a very poor crop for the current season if a damaging frost occurs afterward. In these circumstances, rather than helping the trees, blossom thinning may throw them into a sequence of biennial bearing. Experimental workers are seeking a spraying chemical and procedure of application for thinning blossoms during a heavy flowering season. The objects are to lessen the cost of thinning and to reduce the crop as early as possible in spring in the interests of the following season's crop. The use of chemicals presents many difficulties, as all the blossom is likely to be destroyed unless the right kind and concentration of the material are applied at the correct stage of blooming. The aim is to kill surplus blossom, but to leave sufficient on the tree for a good crop. Whether this method will become common depends on trials which are being carried out.

Proportion of Foliage

The proportion of foliage to fruit on a tree is important to the development of both the crop and future fruiting buds. Apples contain about 85 per cent. by weight of water, the other 15 per cent. being made up largely of sugars, fibrous or cellulose materials, pectin and jelly-forming materials, organic acids, and a very small amount of mineral matter. Apart from the water, almost all these materials are synthesised in the leaves of the tree. To carry out this important task the foliage must function efficiently and, as the quality of the crop depends on the amount of efficient foliage, there is a close association between good foliage, ample growth, fruit size, and regular cropping.

Therefore the thinning of the crop must be related to the amount of foliage which can be allotted to each fruit.

Diseases and Pests

Injury to flowers, buds, spurs, young growth, and roots of trees may be caused by diseases and pests, which thus may affect fruit setting. For example, fireblight affects blossoms, spurs, and growth; powdery mildew affects new growth; brown rot affects blossoms and growth; black spot affects young fruits and foliage; and leaf curl affects foliage, young fruits, and growth.

Many insects also cause direct or indirect harm. Scales, mites, aphides, leaf hoppers, and thrips cause debility of tree foliage and bark. Thrips can also directly affect the vital organs of the flowers such as the pistils and stamens and have been responsible for drastic reduction of crops in some overseas countries. Fortunately thrips are not unduly common in pip- and stone-fruit orchards in New Zealand, but some damage is caused to citrus trees and grape vines.

Spray Injury

Incorrect selection of spray materials or time of spraying may cause damage to fruit buds, blossoms, setting fruit, or foliage. Special care is needed with combination sprays because reactions between the chemicals may cause damage to developing fruit and growth. This type of damage is often increased by very high temperatures at the time of spraying or immediately afterward.

Care needs to be exercised in the use of winter oils or tar washes when bud movement is near, as damage to the buds may occur. For instance, sulphur and oils must not be used in close association at or after the bud-movement stage.

Growers can do much to control the many influences affecting cropping, though certain types of climatic hazards are beyond their control and must be accepted as elements of risk.

Care of Livestock during May

Contributed by the Animal Research Division

BLOOD POISONING IN HOGGETS

BLOOD poisoning in hoggets grazing on turnips is becoming an increasingly important problem. Deaths occur from infection with the blackleg organism, which probably gains entry through the mouth. An excellent vaccine, which confers very good immunity, is now available for purchase in New Zealand. On properties where losses have previously been experienced, hoggets should be vaccinated a fortnight before they are placed on turnips. The nearest Veterinarian or Inspector of Stock should be consulted concerning the method of vaccination.

AUTUMN-SAVED PASTURE

In most districts there is still time to provide good winter grazing by shutting up paddocks and letting them grow during autumn and early winter. Having some pasture cover on paddocks before the first frosts will assist pasture growth during winter. Autumn-saved pasture is invaluable for early-calving cows. It also provides the best insurance against sleepy sickness in ewes. If necessary, feed silage to cows now to enable some paddocks to be shut up. Once the ewes have been tupped they are all the better for being done fairly hard until 3 or 4 weeks before lambing. This also will enable some paddocks to be spelled.

UNTHRIFTY CALVES

The best feed for calves is good fresh pasture, and this can be provided by rotating the calves through the cow paddocks. Good-quality hay is necessary to supplement the sappy young autumn pasture. At the first sign of unthriftiness calves should be drenched with phenothiazine, being given the full dose recommended on the label. Drenching, however, will not be effective unless the calves are properly fed.

PREVENTION OF SUCKING BY CALVES

Sucking of each other by calves is a habit which should be broken as soon as it is detected. The insertion of a bull ring is effective in most cases.

MILKING MACHINE OVERHAUL

As soon as the cows have been dried off arrangements should be made for the milking machine to be overhauled by an expert. Do not install complicated gadgets, but make sure that all parts of the machine are working efficiently. This will not only ensure rapid, trouble-free milking, but is likely to increase production, and will help to reduce mastitis. The Department of Agriculture's Bulletin No. 260 "Mechanical Milking" should be carefully studied by every dairy farmer.

PURCHASE OF HERD SIRE

If a new herd sire will be required this year, now is the time to make inquiries. The New Zealand Dairy Board issues a Sire Survey and Merit Register which gives the production of the daughters of all dairy sires which have been surveyed. Unfortunately very few progeny-tested sires are available, but the Register should be consulted and wherever possible a bull by a proven sire out of a merit cow should be selected. Bull catalogues are issued annually by the Herd Improvement Association and these, too, should prove of considerable value to dairy farmers who are looking for herd sires. The New Zealand Dairy Board is now developing artificial insemination on a commercial basis and farmers interested in making use of this service should get in touch with their local Herd Improvement Association.

INOCULATION OF DOGS AGAINST DISTEMPER

Distemper in dogs can in a very high percentage of cases be prevented by vaccination. This is best done when the pups are 3 to 4 months of age. The virus, which has a short life, is imported from Australia and it is therefore necessary to notify the Veterinarian at least a month before the pups are to be vaccinated.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during February and for the 7 months ended 29 February 1952, with comparative figures for the same month and 7-monthly period of 1950-51, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

	Tons				
Period	Creamery	Whey	Total	% inc. or dec.	Total tons in store at end of mth.
February 1952 ..	16,920	296	17,216	—	28,678
February 1951 ..	15,354	317	15,671	—	45,749
Inc. or dec. ..	+1,566	—21	+1,545	+9.858	—17,071
For 7 mths. to 29/2/52 ..	128,539	2,111	130,650	—	—
For 7 mths. to 28/2/51 ..	123,295	2,318	125,613	—	—
Inc. or dec. ..	+5,244	—207	+5,037	+4.009	—

CHEESE

	Tons				
Period	White	Coloured	Total	% inc. or dec.	Total tons in store at end of mth.
February 1952 ..	10,871	—	10,871	—	19,081
February 1951 ..	11,052	6	11,058	—	29,301
Inc. or dec. ..	—181	—6	—187	—1.691	—10,220
For 7 mths. to 29/2/52 ..	69,894	519	70,413	—	—
For 7 mths. to 28/2/51 ..	76,103	1,519	77,622	—	—
Inc. or dec. ..	—6,209	—1,000	—7,209	—9.287	—

If these figures are converted into butterfat equivalent, there is an increase of 1.159 per cent. in butterfat graded for the 7 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

Supplementary Feeding for Cows: Farm Drainage

Seasonal Notes by the Extension Division

ONE of the most heartening features of New Zealand dairy farm management over the past few years has been a marked improvement in the quality and quantity of supplementary feed conserved for autumn and winter feeding. Even so, the winter feed position on many farms is far from satisfactory and many dairy herds are still inadequately fed over the winter.

EARLY FEEDING

Feeding out should begin early, while there is still some grass growth on the pastures, and not be delayed until the whole farm is bare. The actual date will depend on seasonal conditions, but it is wise to err on the early side rather than to delay feeding out until too late. It is essential to start feeding out before cows start to drop in condition, for once they reach this stage it is difficult to bring them back again. Early feeding out, combined with the use of the electric fence to ration off any available grass, will go a long way toward assuring that stock are carried through the winter in good condition. It is particularly important that young stock be introduced to hay and silage while there is still grass available, so that they can get accustomed to these supplements before the winter sets in.

RESERVES AND RATIONS

To maintain adequate supplementary feeding from season to season reserves of silage should be built up as an insurance against long winters and summer droughts. Such reserves may be made by exploiting to the full efficient break feeding and rotational grazing management methods before the size of the herd is increased, a step which the adoption of these methods will ultimately allow. The quantity of hay and silage that should be fed out over the winter depends on the size of the animal and the amount of available grass, and also on the relative quantities of hay and silage available. If a cow is being wintered on hay, a daily ration of 16 to 18lb. of good hay will satisfy her requirements; if silage is the sole supplement, she should get 45 to 55lb. daily. Young stock need 10lb. of hay or 30lb. of silage. If both hay and silage are being fed, the daily ration should be 25 to 30lb. of silage and 10lb. of hay. If the quality of hay and silage varies on the farm, feed out the poorer material first, reserving the best for feeding out later on.

SAVING GRASS

When closing pastures in the autumn for spring feeding select areas containing species that can grow during the cold weather. Suitable grasses for this purpose are perennial and short-rotation ryegrass, prairie grass, and *Phalaris tuberosa*. It is essential that sufficient autumn-saved pasture be available to satisfy the requirements of the herd until the spring growth comes away properly. The actual area required depends on the quality of the pastures and the calving dates of the herd. If pastures are poor and lacking in ryegrass, a greater area will be needed than if they have ample ryegrass present. A general recommendation for good pastures would be 1 acre for every cow calving in July and ⅔ acre and ⅓ acre for the August and September calvers respectively. Paddocks should be closed in rotation in the autumn. In warmer districts close the first paddock in mid-April, the next a week later, and the remainder at the end of April. In colder areas paddocks need closing much earlier. Paddocks are then available in succession as the cows calve. If possible, avoid closing hay or silage paddocks for autumn-saved pasture; otherwise grasses such as fog and cocksfoot will tend to increase at the expense of the ryegrass and clovers. Providing there is adequate ryegrass in the sward, there is no reason why steeper paddocks, unsuited for mowing, should not be used to grow winter grass. If the paddocks used for autumn-saved pasture are rotated round the farm, there will be no pasture deterioration and the clovers will not suffer.

—*A. V. ALLO*

* * *

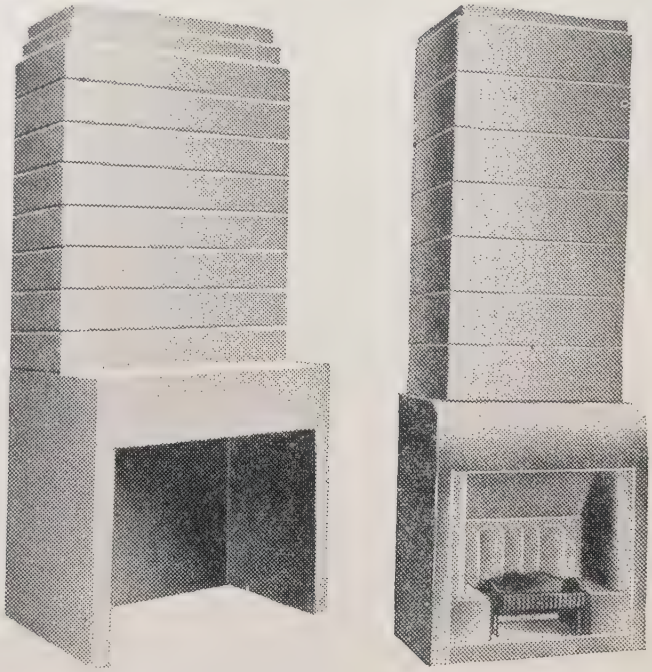
FARM DRAINAGE

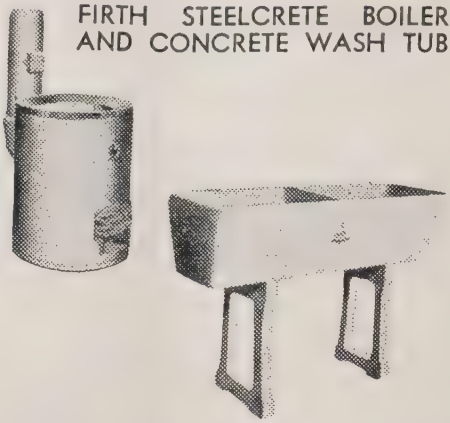
THE object of farm drainage is to remove all excess water as quickly as possible from the topsoil and to maintain the water-table at a level that will permit of healthy growth of pastures and crops. The advantages of good drainage and its importance in good farming cannot be emphasised too much. It is certain that no other farm operation on land requiring drainage will give as good a return for the expenditure incurred as will an efficient drainage system. A drained soil allows full development of the roots of plants, which are as a result much more resistant to drought conditions than plants on undrained soils. Drained soils are warmer in the winter and much earlier in the spring. They can be worked much earlier than wet soils and the cost of tillage is much less. Far less damage is done to the soil texture when crops are fed off on drained land in the winter. There are many other advantages which a well-drained soil has over a soil which lies wet and waterlogged over long periods in the winter and spring, but in pasture land perhaps the greatest advantage of drainage is in the better winter growth, the freedom from such weeds as buttercup, pennyroyal, rushes, and sedges, and the much longer life of the pasture. The number of times the pasture has to be renewed over a period of 28 to 30 years where the soil is frequently waterlogged is a serious problem on much farm land, and the cost of this work would generally be considerably more over a number of years than the cost of an adequate drainage system. This is very definitely so where mole drainage is effective, and there is a great deal of practical evidence that it is also a fact where the more costly method of tile drainage is employed.

PLANNING OF TILE DRAINAGE

Tile drainage is undoubtedly the most efficient and lasting method of ridding farm land of excess water, providing always that the tile drainage system is carefully planned and the tile drains are well and properly constructed. Tile drainage is also the most costly method of drainage and for this reason also good planning and careful work are necessary if severe losses are to be avoided. On flat land in particular, where falls are small, a surveyed drainage plan of the area is considered essential. Such a survey carried out with the proper instruments would show the location and suitability or otherwise of the outlets, the amount and direction of the falls, the nature of the soils down to the depth of the drains, and the reason for the wetness of the area, such as an impervious subsoil or a rising water-table. From the survey and the plan of the area, with the other data about the soil and the reason for the wet conditions, a suitable drainage system can be laid out which would provide for the proper depth and spacing of the drains, ensuring the best and most effective layout for the cheapest expenditure. The layout of the system, with a knowledge of the rainfall and the intensity of rains, gives also the necessary information as to the correct size of tiles it is best to put in on the various lines of drain. When the drainage of any particular area or field is being planned future extensions to include more paddocks or the whole farm should be kept in mind, and the size of tiles used for mains should provide for any such extensions. Even where there are satisfactory falls farmers are well advised to plan carefully the work for a tile-drainage system and to see that the scheme of drains is recorded in a plan of the area for future reference. Advice and assistance on planning tile drainage work are available at all times from officers of the Extension Division.

—*E. W. WILSON*





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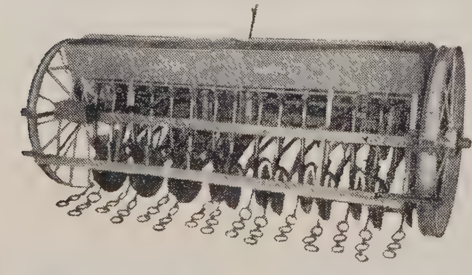

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Buying Laying Birds for a Household Poultry Flock

BEFORE BUYING laying birds the household poultry keeper must consider a number of aspects, including when to buy, what class of bird to buy, and the source from which to obtain them. These points should be clearly understood if the householder is to make a success of poultry, and this article by the Animal Industry Division discusses in detail the main aspects of buying laying fowls.

Reminders for May

Winter egg production is the most important of the year. In addition to feeding No. 1 standard laying mash and grain, keep a trough or tin of pure meat meal in front of the birds at all times. Extra meat meal is an aid to winter laying, and the birds will not eat too much of it.

Colds have a serious effect on winter egg production. Coddling the birds or allowing the house to become stuffy may induce colds, but draughts and damp conditions must be prevented and the litter kept dry.

Supplies of good greenfeed may be difficult to maintain at this time of year. Use a fish oil in the mash to give a satisfactory level of vitamin A, the supply of which substantially affects winter laying.

THE NUMBER of birds to be kept will have been decided when the size of the laying shed was planned, and stocking the shed with more birds than it was intended to hold is most unwise. Overcrowding invariably leads to trouble with either the health of the birds or their production.

Beginning with pullets is economically sound for reasons which will be given in a future article. A pullet is a bird during its first laying year. All birds are subject to an annual moult, when they discard all their feathers before growing new ones. Thus a laying bird is a pullet until it goes into its first annual moult and thereafter is termed a hen. Likewise a male bird is a cockerel until its first annual moult, after which it is referred to as a cock bird.

Time to Buy

The first essential is to know when to buy pullets, and household poultry keepers who lack knowledge of this subject are likely to meet trouble. The main hatching season for poultry is July to October. Heavy-breed birds such as Australorps and Rhode Island Reds are best hatched between July and mid-September; light breeds are hatched satisfactorily up to early October. Pullets hatched later than the months quoted are usually less satisfactory, being slower in growth and late coming into production. Growth and sexual development of pullets may vary from season to season, but household poultry keepers are recommended to buy birds hatched within the periods named whenever possible and cautioned against buying late-hatched pullets.

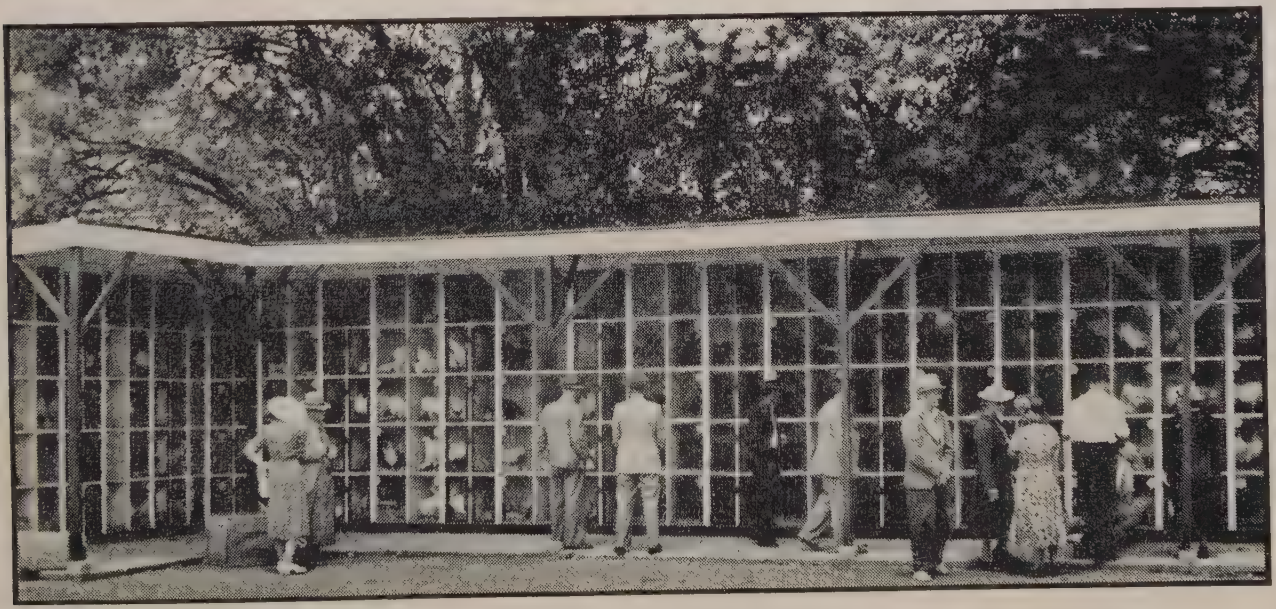
The age at which pullets come into production will vary with the season, the way in which the birds have been managed, and to some extent the strain of birds. As a guide it may be assumed that heavy-breed pullets should be in production at about 6½ months of age and light breeds at 5 to 5½ months. For crossbred pullets such as Australorp-White Leghorns the period is similar to that for Leghorns.

In general commercial poultry farmers, from whom pullets are usually bought, tend to retain the earlier-hatched pullets for their own use and in consequence household poultry keepers are often sold September- and October-hatched birds. This means that heavy-breed pullets will not start laying until March and light breeds a month earlier. Many owners are fortunate if their pullets come into lay in these months.

Many household poultry keepers make the serious mistake of omitting to order pullets for the approaching laying season until the end of the year or even well into the new year. By this time most good commercial poultry farmers have either sold all pullets surplus to their own requirements or have booked up for all they intend to sell. Such pullets as are available at this stage are likely to be late-hatched or poor-quality, slow-developing birds left after the best have been sold. Neither late-hatched nor cull birds are likely to be satisfactory, as the first will come into lay late and thus not produce when eggs are dear, and the second are likely to be lacking in constitution and be poor producers. Consequently poultry keepers are advised to place orders for pullets not later than the beginning of the breeding season—that is, in July.

Age of Pullets

The first stage in the rearing of chicks is brooding them. In general brooding lasts about 6 weeks, during which time the chicks are given heat, the amount being decreased as the birds increase in age. When they are hardened off and away from all heat



A public poultry market, even as well arranged as this one, is not the most satisfactory source of laying birds for the household poultry keeper. Poultry farmers usually dispose of their discarded hens and cull pullets through the markets, and such birds, though they may be quite healthy, are really fit only for the table.

the birds are usually taught to perch. The perching pullets commonly advertised are from 6 to 10 weeks old.

The price charged for pullets varies with their age, young perching pullets selling at from 6s. to 10s. each and ready-to-lay or in-lay birds at from 18s. to 25s. each.

During their growing period after the brooder stage pullets undoubtedly develop most satisfactorily in both constitution and frame if given a free run over good grassland; even a grass pen of adequate size for the number of birds is an advantage. Consequently the householder may well gain in the long run, though the initial cost is greater, if he buys well-developed pullets instead of confining 8- or 10-week pullets inside a laying shed during the growing period and up to laying stage. The average household poultry accommodation, limited in space in both shed and outside run (if one is available), does not afford the best conditions for running growing pullets.

Growing pullets must not be mixed with adult laying birds. If that is done, the older birds bully the pullets and prevent them from obtaining their fair share of food. The result is stunted pullets, late laying, and possibly losses.

Choice of Breed

In general terms there is no "best breed" for egg production, but much may depend on the strain of birds selected. Laying ability depends to a large degree on how the birds have been selected and bred for production over a period of years. The householder has one marked advantage over the poultry farmer: Pullets produce best in small units such as the six or a dozen kept in the garden, in which there is a lack of competition for food and the minimum of bullying. Like animals, some birds are timid and nervous and others are robust or even ruthless bullies.

Apart from their greater size, heavy breeds such as the Australorp or Orpington also differ from the light breeds in their tendency to become broody. Some strains of heavy-breed birds are far more broody than others, and some commercial poultry breeders take the trouble to mark and ultimately exclude from the breeding pens heavy-breed birds which show excessive broodiness, thus gradually reducing this characteristic. Lighter breeds show comparatively little or no broodiness. To some extent lack of broodiness explains the popularity of the White Leghorn, as broodiness entails a temporary loss of eggs and the trouble of breaking broodiness in a bird when she wants to sit.

A good 5-months-old Australorp-White Leghorn pullet. Sometimes known as the Austral-White, this cross is the most common in New Zealand. Crossbred pullets have become more popular in recent years and are highly suitable for the household poultry keeper.

Against this apparent disadvantage of heavy breeds must be counted the fact that good laying strains of heavy-breed pullets are excellent winter egg producers and on an average superior in this respect to light-breed pullets. Eggs laid in winter are more valuable, this being the period of short supply and high price. Furthermore, breaking broodiness in the average broody pullet is not as difficult as is generally supposed, provided the birds are handled properly; the less numerous excessively broody birds can be a real nuisance during late spring and summer.

White Leghorns are by far the most popular light breed in New Zealand. Brown Leghorns and Minorcas, though kept in small numbers, are usually difficult to obtain. Australorps, or Orpingtons, and Rhode Island Reds are the popular heavy breeds and good strains of both are excellent layers.

Crossbred pullets have become popular during recent years. Most of them are bred from Australorp males and White Leghorn females, though the reverse cross is also used; "Austral-Whites" is a name sometimes applied to these first-cross birds. Another crossbred which is excellent for egg production is bred from White Leghorn males mated to Rhode Island Red females. Crossbred pullets are highly suitable for the household poultry keeper, who usually is not concerned with breeding, for which pure breeds are required. The crossing of two distinctive breeds results in increased vigour and production if parent stock with good constitution and productive ability are used. These crossbred pullets are intermediate in size between light- and heavy-breed birds, and their broodiness depends on the care with which the heavy-breed parent stock has been selected to reduce this characteristic.

Health and Constitution

Of equal importance to the laying ability of the birds is their health and constitution. Potential production is of little value if birds will not live and remain healthy.

Public auctions are not the most satisfactory sources of laying pullets. Poultry farmers usually dispose of their discarded hens and cull pullets through the markets. Such birds, though they may be quite healthy, are really fit only for the table. If they were good laying birds, they would not be sent to the auction to fetch poultry-meat prices when they could be retained on the farm for laying or be sold as laying pullets at higher prices.

The household poultry keeper in the main depends on the poultry farmer for his supply of laying pullets, the quality of which varies. Advertisements may be answered, but where possible it is a good plan to visit the farm from which the birds are to be bought and see the stock and conditions. A householder may not be a judge of poultry stock, but he can see whether the birds on the farm look healthy and are kept under clean and hygienic conditions. A tidy, well-managed farm is not difficult to recognise; the reverse is usually self evident.

Accreditation Scheme

For the past 6 years the Department of Agriculture has administered the New Zealand Poultry Flock Improvement Plan. Poultry farmers may support this plan voluntarily, their breeding birds being examined each year and accredited if they appear healthy and are up to a reasonable breeding standard. The names of poultry farmers whose breeding flocks are accredited are included in a list printed each year, a copy of which may be obtained from the Department of Agriculture, P.O. Box 2298, Wellington, or by writing to an office of the Department in any city or main town. The list also gives the breeds which each farmer keeps and the number of his breeding birds.

Two recommendations are made to household poultry keepers: Book pullets early, and when a satisfactory source of supply is found return to that source each year; if in difficulty in finding pullets, approach Poultry Instructors of the Department of Agriculture, who are stationed at the offices of the Department in Auckland, Hamilton, Wanganui, Hastings, Wellington, Christchurch, Oamaru, and Dunedin.

Photographs by Fraser Niederer.

JOURNAL OF THE BRITISH GRASSLAND SOCIETY

This Journal is a medium for the publication of the results of research and practical experience in the realm of Grassland Husbandry.

Contents of Vol. 6, No. 1, 1951.

1. The place of the ley in farming systems. T. L. Bywater.
2. Lessons from American grasslands. William Davies.
3. Preliminary investigations on ley cropping for large-scale green crop drying. C. A. Shacklady and P. Newbound.
4. The grasslands of South-east South Australia in relation to climate, soils and developmental history. N. S. Tiver and R. L. Crocker.

This Journal is published quarterly. Subscription Vol. 1, 15s. Annual Subscription thereafter, 30s. per volume. Orders to Secretary, British Grassland Society, Fakenham, Norfolk.

Chemical Methods of Weed Control

THE effective control of weeds is always a subject of great interest to market gardeners, farmers, and those concerned with pasture improvement. The Extension Division of the Department of Agriculture has conducted extensive trials on weed control by chemical methods, and in this, the first part of a two-part article, L. J. Matthews, Weeds Research Officer, Department of Agriculture, Wellington, gives information on the results so far obtained from these trials. The writer gives details of the various chemicals and their effect on different types of weeds, and advice on the best time of application of each preparation. The second part of the article will appear in next month's issue.

THE chemical weedkillers consist of two groups, the hormone preparations and the non-hormone, the latter including the grass-weed killers and the phenol preparations.

HORMONE WEEDKILLERS

Hormone weedkillers, more correctly called growth-regulating compounds, form an important group. Most weeds fall into the category of broad-leaved, flowering plants and many are destroyed by this group of chemicals. The advantages of hormone weedkillers over other types of chemicals used for weed control are that they are non-poisonous to animals, non-corrosive, and relatively easy and pleasant to use. They are derived from three parent materials, M.C.P. A (2 methyl, 4 chlorophenoxyacetic acid), 2,4-D (2,4-dichlorophenoxyacetic acid), and 2,4,5-T (2,4,5-trichlorophenoxyacetic acid).

Salts, Amines, and Esters

From each of the parent acids (M.C.P., 2,4-D, and 2,4,5-T) the following salts, amines, and esters are formulated:—

Sodium salt of M.C.P.: This is the most selective hormone weedkiller; it kills a smaller range of weeds than the 2,4-D preparations, weeds with a waxy leaf being little affected. It is the most suitable preparation for crop spraying.

Sodium salt of 2,4-D is slightly more toxic and hence less selective than the sodium salt of M.C.P. As it is only 4 per cent. soluble in water, it is always sold as a powder, but for ease in mixing a 3 per cent. mix is recommended, that is, 3lb. of sodium salt to 10 gallons of water.

Amine salt of 2,4-D: This material is more toxic than the sodium salt of 2,4-D. It has been employed largely for the control of weeds in crops, but as it is less selective than the sodium salt of M.C.P., there is more likelihood of crop damage. Its use should be further developed for weeds that are difficult to kill such as convolvulus and Californian thistle, which possess a mass of interlacing roots. With these weeds a slow foliage kill results in fewer regrowths than if the above-ground parts are destroyed quickly by the ester preparations.

Flat weeds in pastures are eradicated very easily with hormone weedkillers, but trials have demonstrated that elimination of this type of weed does not give increased pasture production unless the weeds are replaced by desirable pasture species.

Poa (Glyceria) aquatica in a drainage canal in the Hauraki Plains district.

Esters of 2,4-D: As is shown in Table 1 on page 274 both volatile and non-volatile esters are manufactured. Because volatile esters pass off toxic fumes under high temperatures, they are dangerous to nearby plants if humidity is high and the wind is negligible. In enclosed spaces non-volatile esters should be used. It should be noted, however, that spray drift of both non-volatile and volatile materials is toxic. The esters are largely oil based and, unlike the water-based preparations, are not affected by rain immediately after application.

The esters are the most potent materials. As contact chemicals for the destruction of annuals and seedling perennials the oil-based esters are two or three times as toxic as the salts, but on deep-rooted perennials they usually give inferior results. The water-based salts and amines are repelled by plants such as periwinkle which possess a waxy coating, or cuticle, on the leaves. For such plants an oil-based ester is necessary to secure penetration or absorption of the hormone. The addition of dieselene or kerosene also aids absorption of the hormone into weeds such as periwinkle which are difficult to kill.

In general terms esters give better penetration, but not translocation, that is, movement of weedkiller into the roots. The salts and amines have poorer penetration, but are translocated better in the plant. If sufficient penetration is secured, the salts and amines give a slow foliage kill, which ensures that the roots are partly or wholly destroyed, so that fewer regrowths occur than if the foliage had been killed quickly.

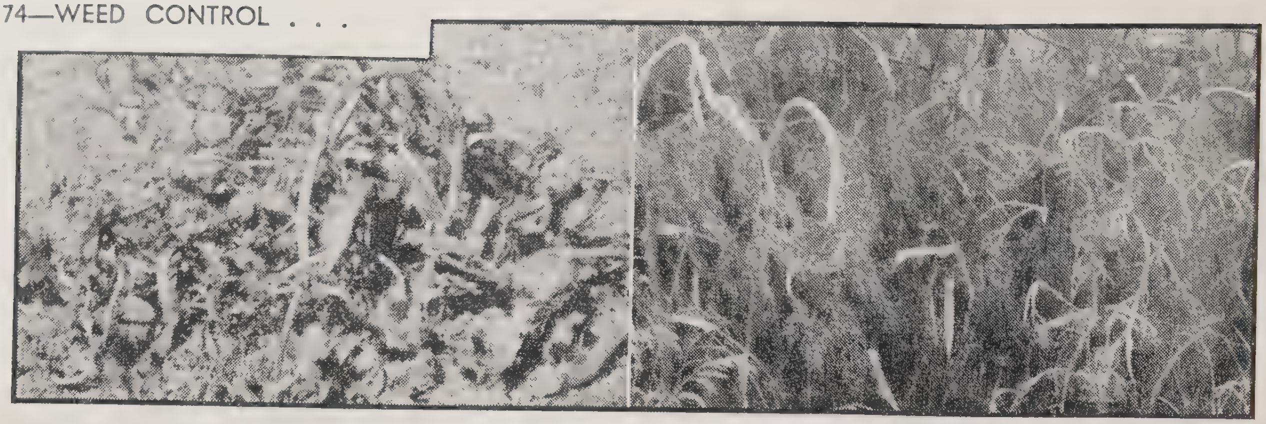
A recent development is the preparation of water-based esters. They have a higher toxicity per unit than the oil-based esters and also possess some of the properties of amines and salts. Consequently, they may prove valuable for the destruction of deep-rooted perennials with leaves sufficiently waxy to repel the salts and amines.

As shown in Table 1, M.C.P. and 2,4-D formulations control annual and herbaceous perennials. The 2,4-D esters also control a few species of woody perennials.

Formulations of 2,4,5-T: The properties of 2,4,5-T amines and esters closely parallel those of the 2,4-D amines and esters. The 2,4,5-T formulations are used for the control of woody perennials resistant to the 2,4-D preparations. As a rule both 2,4-D and 2,4,5-T formulations are specific in their action. Mixtures of 2,4-D and 2,4,5-T are not recommended for New Zealand conditions.

Acid Equivalent

The term "acid equivalent" refers to the active principle of the hormone preparations. For liquids the acid equivalent is expressed in pounds of active weedkilling material per gallon, and for dusts the amount of active



Docks (left) and fennel (right) can be eradicated with hormone weedkillers in the seedling stage only, as they develop high resistance with maturity. The twisting illustrated is the result of an application of weedkiller, and indicates resistance in the mature plant.

TABLE 1—HORMONE WEEDKILLERS AVAILABLE IN NEW ZEALAND

Type	Formulation	Trade name	Acid equivalent per gallon of liquid or pound of dust	Volatile or non-volatile	Form of weedkiller*	Type of weed
M.C.P.	Sodium salt	"Agroxone" ..	1.0	N.V.	Water	Annuals, herbaceous perennials, and crops
		"Agroxone 3" ..	3.0	N.V.	Water	
		"Phenoxylene 30" ..	3.0	N.V.	Water	
		"Tuloxone 10" ..	1.0	N.V.	Water	
		"Tuloxone 30" ..	3.0	N.V.	Water	
		"Agroxone Powder"	.001	N.V.	Talc	
	†Amine			N.V.	Water	Resistant crops
	†Butyl ester			V.	Oil	
2,4-D	Sodium salt	"Phenoxone" ..	.82	N.V.	Water soluble powder	Annuals, herbaceous perennials, and crops
		"Frenokone" ..	.75	N.V.		
		"SHWK"	.75	N.V.		
		"Economone" ..	.75	N.V.		
		"Stantox 90" ..	.75	N.V.		
	Amine salt	"Stantox 20" ..	2.0	N.V.	Water	Annuals, herbaceous perennials, and resistant crops
		"Stantox 64" ..	4.0	N.V.	Water	
		"Weedar 77" ..	4.8	N.V.	Water	
		"Ataweed"	1.25	N.V.	Water	
		"Ataweed Concentrate"	4.0	N.V.	Water	
	Ethyl ester	"Stantox P44" ..	4.0	V.	Oil	Annuals, semi-woody perennials, and perennials with waxy cuticles
		"Weedone 57 V." ..	3.6	V.	Oil	
		"Ethone"	3.6	V.	Oil	
		"Ataweed"	3.6	V.	Oil	
		"D.40"	4.0	V.	Oil	
		"Weedust 5"	.04	V.	Talc	
		"Weedust 15" ..	.12	V.	Talc	
		"Weedust Concentrate"	.25	V.	Talc	
	Butoxy ethanol ester	"Weedone 57 N.V."	4.8	N.V.	Oil	As for ethyl ester
	†Polyethylene glycol ester Propylene glycol butyl ether ester	"A.C.P.-W.30" ..	4.5	N.V.	Water	For difficult - to - kill semi-herbaceous perennials
		"Esteron 2,4-D" ..	4.0	N.V.	Water	
2,4-D 2,4,5-T	Butoxy ethanol esters	"Brushkiller 32" ..	1.6 0.79	N.V.	Oil	Not warranted for New Zealand weeds
2,4-D 2,4,5-T	Butoxy ethanol esters	"Weedone Standard"	0.6 0.3	N.V.	Oil	
2,4-D 2,4,5-T	Ethyl ester Butyl ester	"Stantox T.45" ..	1.9 2.1	V.	Oil	
2,4,5-T	Salt	Not manufactured to date				
	Triethanol-amine salt	"Relionus 2,4,5-T" ..	3.5	N.V.	Water	Treatment of new growth of blackberries
	Butyl ester	"Butoxone" ..	3.6	V.	Oil	Brush or scrub plants, for example, woody perennials and scramblers like blackberries
		"Stantox T.45S" ..	3.4	V.	Oil	
		"Summit 2,4,5-T" ..	3.6	V.	Oil	
		"Relionus 2,4 5-T" .	3.6	V.	Oil	
		"Weedone Special V."	3.6	V.	Oil	
	Butoxy ethanol ester	"Weedone Special N.V."	3.6	N.V.	Oil	As for butyl esters
	†Polyethylene glycol ester †Propylene glycol butyl ether ester	"A.C.P.-W.52" ..	5.0	N.V.	Water	For difficult-to-kill herbaceous woody perennials, for example, blackberry, especially re-growths, and first year canes
		"Esteron 2,4,5-T" ..	4.0	N.V.	Water	

* Form of weedkiller: Water = water-based; oil = oil-based; talc = in dust form with a talc filler.

† Not available on the market. Experimental quantities available or shortly available. New products, for example, the ethyl-amine salts of 2,4-D and 2,4,5-T, will also be shortly marketed. The straight butyl esters will also be changed to the isomeric esters of the butyl ester of 2,4,5-T. This type of ester is more easily emulsified.

principle per pound of dust. The acid equivalent is the standard for comparison of the potential weedkilling materials in the various formulations. Table 4 shows that one acre of variegated thistle seedlings may be controlled with 0.5lb. of acid equivalent per acre of a water-based salt. This means that if a salt listed in Table 1 contains 3lb. of acid equivalent per gallon, 1 gallon of this product would control 6 acres of young variegated thistle.

Application

Very often weeds requiring treatment are so scattered that an over-all spray is not warranted. In these conditions the rates given in Table 4 may be converted into a spray mixture concentration showing parts per million (p.p.m.) of the hormone in water (see Table 2). The plants should be spot treated with the spray concentration indicated, and a complete foliage and stem cover should be secured, especially for woody perennials.

GRASS-WEED KILLERS

Unlike hormone weedkillers, which control broad-leaved flowering weeds and are non-toxic to grasses, the grass-weed killers T.C.A. and I.P.P.C., two new forms recently developed, control grasses and are relatively non-toxic to broad-leaved flowering plants at normal rates of application.

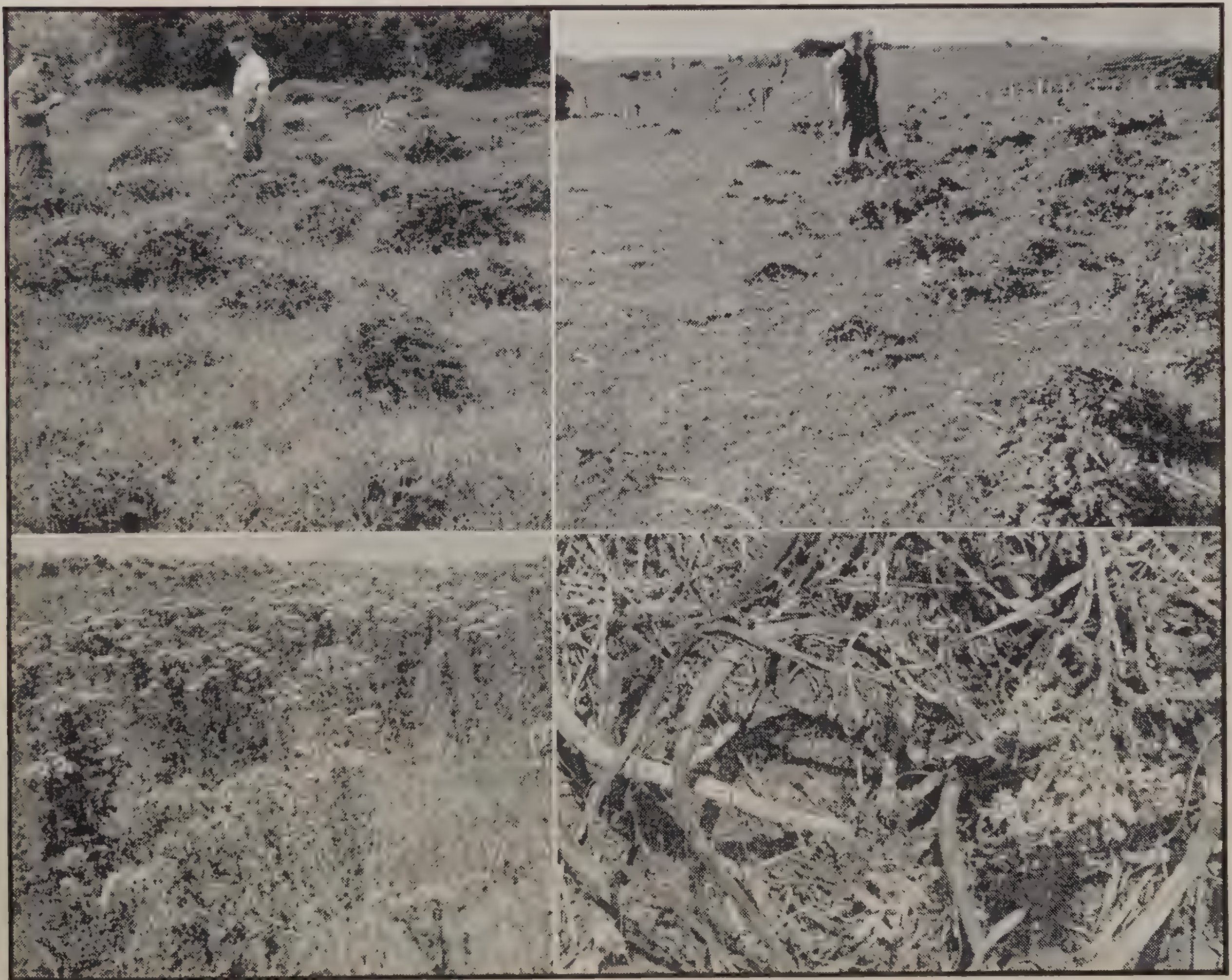
Table 3 gives details of these preparations.

TABLE 2—CONVERSION OF ACID EQUIVALENT INTO PARTS PER MILLION (P.P.M.) OF HORMONE IN WATER

Acid equivalent of products	Pints of products to be added to 100 gallons of carrier			
(See Table 1)	1000 p.p.m.	2000 p.p.m.	3000 p.p.m.	4000 p.p.m.
1.0	8	16	24	32
2.0	4	8	12	16
3.0	2 2/3	5 1/3	8	10 2/3
4.0	2	4	6	8
5.0	1 3/5	3 1/5	4 4/5	6 2/5

TABLE 3—NEW GRASS-WEED KILLERS

Type	Formulation	Acid equivalent per lb.	Form of weedkiller
T.C.A.	Sodium salt	79.3 per cent.	Water soluble powder
I.P.P.C.	Ester	Approx. 1lb. Approx. 1lb. Approx. 1lb.	Oil Wettable powder Dust



Chemical control of ragwort. Upper left—Ragwort is eradicated with hormone weedkillers if the first application is made when the flower stalk bolts from the rosette, the stage illustrated. Upper right—An area which was infested with ragwort and which has had the initial application with water-based salts and amines (left) compared with an untreated area (right). Lower left—If plants are sprayed at the seed-head stage, especially with water-based salts and amines, results are disappointing. Best results are obtained with oil-based esters. Lower right—Stem twisting and leaf kill of mature plants as a result of being sprayed with an ester preparation. Such late treatment often results in the formation of viable seed and strong regrowths.

CHANGES OF ADDRESS OF "JOURNAL" SUBSCRIBERS

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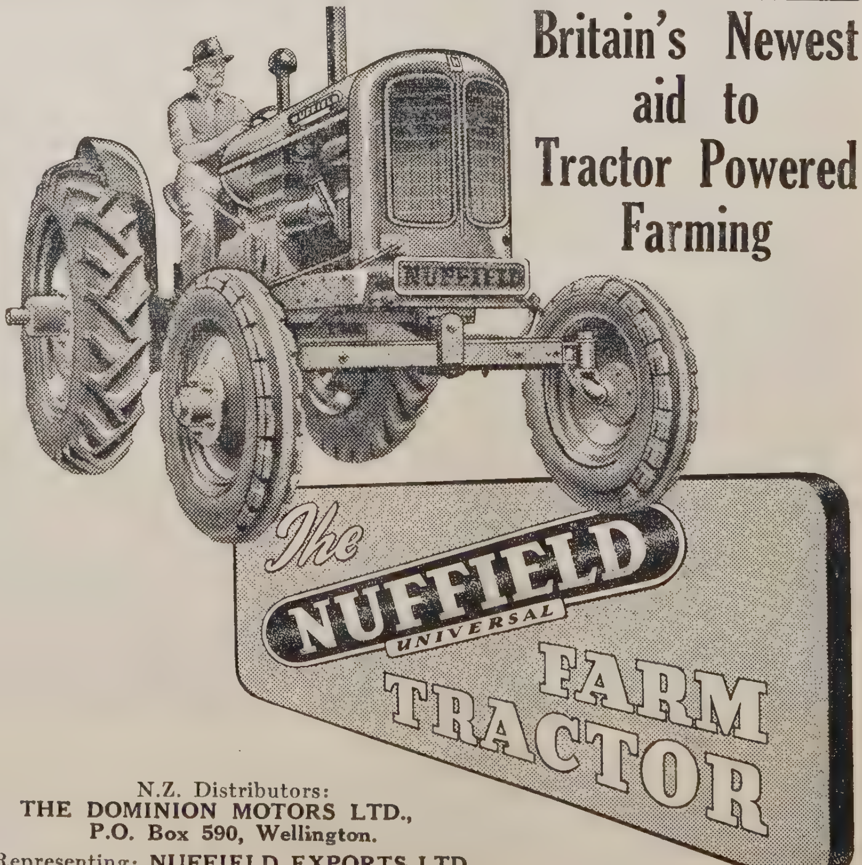

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Much more experimental work is required with T.C.A. and I.P.P.C., especially on the eradication of grassy weeds in crops.

Properties

T.C.A.: All the weedkilling preparations of this type are derived from the parent material trichloroacetic acid. The sodium salt has been the most widely used, but the calcium salt may find a place. The sodium salt of T.C.A. is slightly corrosive and irritating to the skin.

I.P.P.C. or **I.N.P.C.** are abbreviations for O-isopropyl-N-phenyl carbamate. I.P.P.C. is available as a wettable powder which can be dispersed in water and sprayed, or mixed with other carriers such as fertilisers; it can also be used as an emulsifiable liquid which readily dissolves in water or oil and is applied as a spray. I.P.P.C. has no disagreeable properties.

Mode of Action

T.C.A. and the emulsifiable form of I.P.P.C. have a destructive contact action on the foliage of most plants, but the most important effect is the destruction of grasses by application of the preparations to the soil. The mode of entry is through the roots. For activation both materials require moist soil, and, if possible, applications should be made before rain. On heavy soils up to 1in. of rain is required for activation. Both materials are more efficient on soils where leaching is not rapid; their efficiency is impaired on heavy clay soils.

The most effective method of employing these materials is in conjunction with cultivation. I.P.P.C. is most effective as an annual-grass killer, but it will also destroy seedlings of perennial grasses. T.C.A. will destroy both annual and perennial grasses. The most effective way of utilising T.C.A. is to plough the area and spray the upturned sod. Alternatively, the grass may be mown, disced, or burnt before the weedkillers are applied. Among the perennial grasses the twitches are the most susceptible, and fibrous-rooted grasses are the most resistant.

TABLE 4—TOLERANCE OF PASTURE WEEDS TO HORMONE WEEDKILLERS

Weed	Recommended formulation and rate of acid equivalent per acre	Most effective stage of growth	Time of year for treatment	Remarks
ANNUALS				
Susceptible Buttercup (*Ranunculus* spp.) Cotton thistle (*Onopordon acanthium*) Variegated thistle (*Silybum marianum*) Winged thistle (*Carduus tenuiflorus*)	Salts of M.C.P., salts and amines of 2,4-D: For seedlings 0.5lb.; older plants 1lb.	As seedlings, but plants susceptible up to flower-head formation	Spring and autumn	For most of these weeds oversowing and fertilisers are required to arrest further reinfestation by seedlings
PERENNIALS (Taprooted)				
1. Susceptible Catsear (*Hypochaeris radicata*) Hawkbit (*Leontodon hispidus*) Nodding thistle (*Carduus nutans*) Pennyroyal (*Mentha pulegium*) Ribgrass (*Plantago lanceolata*) Scotch thistle (*Cirsium lanceolatum*) Storksbill (*Erodium cicutarium*)	Salts of M.C.P., salts and amines of 2,4-D: For seedlings 0.5lb.; older plants 1lb.	As seedlings, but plants susceptible up to flower-head formation	Spring and autumn	Plants establishing from root suckers should be in full leaf before being treated
2. Moderately tolerant Broad-leaved dock (*Rumex obtusifolius*) Curled dock (*Rumex crispus*) Fiddle-leaved dock (*Rumex pulcher*)	For seedlings esters of 2,4-D at 1 to 2lb.; older plants 2 to 3lb.	As seedlings, but plants susceptible up to flower-head formation	Spring and autumn	Curled dock is more susceptible than broad-leaved dock. Fiddle-leaved dock is the most resistant species. The water-based esters show promise of controlling docks without doing excessive damage to clovers
Rushes (*Juncus* spp.)	Esters of 2,4-D at 1 to 2lb.	As seedlings, but rushes susceptible up to pre-flower formation after mowing	Winter and spring mowing; summer treatment	Of the tall rush species *Juncus effusus* is most susceptible. *J. pauciflorus* and *J. vaginatus* are more tolerant. *J. polyanthemos* and *J. pallidus* are probably resistant. Tall rush species should be mown before treatment and new growth sprayed in the summer months when 6 to 12in. high. The small rush species are probably controlled without prior cutting, for example, toad rush (*J. bufonius*), etc.
PERENNIALS (Spreading roots)				
1. Susceptible Buttercup spp. (*Ranunculus acer*, *Ranunculus repens*) Californian thistle (*Cirsium arvense*) Daisy (*Bellis perennis*) Ragwort (*Senecio jacobaea*) Russian knapweed (*Centaurea repens*)	Salts of M.C.P., salts and amines of 2,4-D: For seedlings 0.5lb.; older plants 1 to 2lb.	As seedlings; plants establishing from suckers should be treated when approaching flower-head formation	Late spring and early summer	Established plants require repeat applications for control. First treatment is made at the flowering stage, followed by autumn or spring applications when the weeds are in the rosette stage. Plants arising from suckers should not be treated before full leaf development. In all cases a slow foliage kill should be aimed at and the acid equivalent should be altered to suit local conditions
2. Moderately tolerant Self-heal (*Prunella vulgaris*)	Salts and amines of 2,4-D: For seedlings 1lb.; older plants 1 to 2lb.	As seedlings, but plants slightly susceptible up to flower-head formation	Late spring and early summer	Established plants require repeat applications for control

TABLE 5—TOLERANCE OF WEEDS IN WASTE PLACES TO HORMONE WEEDKILLERS

Weed	Recommended formulation and rate of acid equivalent per acre	Most effective stage of growth	Time of year for treatment	Remarks
PERENNIALS (Taprooted)				
1. Susceptible Burdock (*Arctium lappa*) Capeweed (*Cryptostema calendulacea*) Dandelion (*Taraxacum officinale*) Mouse-ear (*Hieracium pilosella*) Vetch (*Vicia sativa, Vicia angustifolia*) Water hyacinth (*Eichhornia crassipes*)	Salts of M.C.P., salts and amines of 2,4-D: For seedlings 0.5 to 1lb.; older plants (except water hyacinth) 1 to 2lb.	As seedlings, but plants susceptible up to flower-head formation	Spring and autumn (except water hyacinth)	Water hyacinth is best controlled in late-autumn and winter months. The most effective material is amine salt of 2,4-D applied at 3 to 6lb. per acre. A follow-up spray is essential for complete destruction. If treated in the dormant season, the plants missed in the first application may be controlled before they multiply
2. Moderately tolerant Beaked parsley (*Anthriscus vulgaris*) Hemlock (*Conium maculatum*) Tutsan (*Hypericum androsaemum*) Wild parsnip (*Pastinaca sativa*) Wireweed (*Polygonum aviculare*)	Oil-based esters: For seedlings 1lb.	As seedlings, but plants show slight degree of susceptibility up to flower-head formation when weedkiller applied at rates of 3 to 4lb.	Spring and autumn	Plants show sufficient susceptibility to be controlled at high rates of application. **Note:** Hemlock shows sufficient reaction to be made edible to stock by spraying. In the case of horses and other non-ruminants poisoning will occur because the hormones do not alter the poisonous nature of the alkaloids. Mature tutsan plants are best treated with 2,4,5-T esters in summer
PERENNIALS (Spreading roots)				
1. Susceptible Bindweed (*Convolvulus arvensis*) Bell vine (*Calystegia sepium*) Stinging nettle (*Urtica dioica*) Tansy (*Tanacetum vulgare*) Watercress (*Nasturtium officinale*)	Salts and amines of 2,4-D: For seedlings 0.5 to 1lb.; older plants 1 to 2lb.	As seedlings, but plants susceptible up to flower-head formation	Summer months for mature plants; spring and autumn for seedlings	Established plants require repeat applications for control. First treatment is made at the flowering stage, followed by autumn or spring applications. Plants arising from suckers should be treated when in full leaf. A slow foliage kill is required to ensure few regrowths
2. Moderately tolerant Australian fireweed (*Erechtites atkinsoniae*) Dead nettle (*Lamium album*) Fennel (*Foeniculum vulgare*) Mint (*Mentha arvensis*) Parsley dropwort (*Oenanthe pimpelinoides*) Sheep's sorrel (*Rumex acetosella*) St. John's wort (*Hypericum perforatum*) Waxweed (*Hydrocotyle* spp.) Willow weed (*Epilobium* spp.) Yarrow (*Achillea millefolium*)	For seedlings oil-based esters of 2,4-D at 1lb.; older plants oil-based esters of 2,4-D at 1 to 2lb.	As seedlings, but plants susceptible up to flower-head formation	Spring and autumn for seedlings; spring and early summer for mature plants; summer and autumn for regrowths	Repeat applications required for destruction of plants. Mature plants of Australian fireweed are probably most effectively destroyed with repeat applications of esters of 2,4,5-T. The New Zealand spp. *Erechtites prenanthoides* is susceptible to oil-based esters of 2,4-D
3. Resistant Periwinkle (*Vinca major*)	Oil-based esters of 2,4-D and kerosene 1 : 20 applied at 3 to 4lb.	Seedlings probably susceptible to oil-based esters and water	Late summer and early autumn	The addition of kerosene or dieselene would help penetration. Repeat applications are necessary for destruction
ANNUALS				
1. Susceptible Bathurst burr (*Xanthium spinosum*) Chamomile (*Matricaria chamomilla*) Cut-leaved geranium (*Geranium dissectum*) Hedge mustard (*Sisymbrium officinale*) Willow weed (*Epilobium* spp.)	Salts of M.C.P., salts and amines of 2,4-D: For seedlings 0.5lb.; older plants 1lb.	As seedlings, but plants susceptible up to flower-head formation	Spring and autumn	Plants are controlled very effectively with oil-based esters if growing in association with more tolerant species

TABLE 5 (Cont.)—TOLERANCE OF WEEDS IN WASTE PLACES TO HORMONE WEEDKILLERS

Weed	Recommended formulation and rate of acid equivalent per acre	Most effective stage of growth	Time of year for treatment	Remarks
ANNUALS (Cont.)				
2. Moderately tolerant				
Australian flax (*Linum marginale*) Cudweed (*Gnaphalium luteo-album*) Fleabane (*Erygeron crispus*) Foxglove (*Digitalis purpurea*) Marshmallow (*Althaea officinalis*)	For seedlings salts and amines of 2,4-D applied at 1lb.; for older plants esters of 2,4-D at 1 to 2lb.	As seedlings, but plants susceptible up to flower-head formation	Spring and autumn	Plants tend to repel water-based materials in advanced stages of growth
3. Resistant Cleavers (*Galium aparine*)	As seedlings 1 to 2lb. esters of 2,4-D	As seedlings; old plants resistant to water and hormone mixtures	Spring and early summer	Mature plants probably controlled with 2,4-D esters and dieselene mixture

PHENOLS

The three preparations of phenol weedkillers are P.C.P. (pentachlorophenol), D.N.O.C. (sodium salt of dinitro-orthocresol), and D.N.B.P. (ammonium salt of dinitro-orthosecondary butyl phenate). Preparations of P.C.P. are not marketed in New Zealand and formulations of D.N.O.C. have been replaced largely by the D.N.B.P. products, which have been developed more recently. Specific use of the phenols, especially of the D.N.B.P. products, is for the weeding of leguminous crops such as peas and clovers. They can be used where hormone weedkillers would cause excessive damage. Preparations of P.C.P. and D.N.O.C. fortified with aromatic oils such as kerosene and dieselene can be used as contact killers. The chief disadvantage of these materials, particularly the new D.N.B.P. products, is that they are acute poisons and the manufacturers' recommendations for use should be followed closely.

Table 6 summarises the forms of phenol weedkillers.

TABLE 6—PHENOL WEEDKILLERS

Type	Formulation	Trade name	Active principle (per cent.)	Form of weedkiller
P.C.P.	Not marketed in New Zealand as a weedkiller			
D.N.O.C.	Sodium salt	"Sinox"	30	Water soluble
		"Selectone"	30	Water soluble
D.N.B.P.	Ammonium salt	"Sinox W."	13	Water soluble
		"Sevtox"	20	Water soluble
		"Selectone Selective"	13	Water soluble

The phenols are true plant poisons, as they destroy only that part of the plant with which they come in contact. They are more toxic in warm temperatures. The oil solutions of the phenols are the most effective preparations, and next are the water solutions of the ammonium salts. The sodium salts are inferior and require activation with acid salts such as sulphate of ammonia.

Twin cress in young swards may be destroyed by a treatment with water-based hormones. This would eliminate the serious tainting of dairy produce by this weed. After it has been sprayed the area should not be grazed until the weed has died, as hormone treatment does not affect the toxin which causes the taint.

Phenol preparations in oil will destroy annual plants and seedling perennials. Salts of D.N.O.C. activated with sulphate of ammonia kill most annual and perennial seedlings, but plants with a waxy leaf surface and grassy weeds are not killed. The preparations of D.N.B.P. are very selective and kill only the seedling growth of broad-leaved weeds; weeds with a waxy leaf are susceptible only in the seed-leaf stage.

TYPES OF WEEDS

In many cases the most suitable material to use for weeds growing in waste places (Table 5) is the oil-based ester of 2,4-D, as usually these weeds are not growing in association with plants of value.

The weeds listed in all the tables dealing with tolerance to hormone weedkillers are grouped into annuals and perennials; the perennial plants are further grouped into:—

(a) Plants with a taproot and a few subsidiary lateral roots.

(b) Plants without a main taproot but possessing interlacing lateral roots.

Annuals and perennials can be divided further into susceptible plants (controlled with water-based materials), moderately tolerant (controlled with esters), and resistant (controlled only with repeat applications of esters in an oil base, for example, dieselene).

Annual weeds are most easily destroyed as seedlings and in most cases are highly susceptible and may be killed with one application of weedkiller. The oil-based esters of hormone weedkillers are the most effective formulations.

Perennial weeds possessing a taproot are usually killed with one application. Biennial plants, if susceptible, also fall into this category. The oil-based esters are the most effective formulations when the plants are seedlings. Established plants are best treated with water-based materials.

Perennial weeds with lateral roots are usually difficult to control and frequently require more than one application for complete destruction. The oil-based esters are the most effective formulations if the plants have a waxy coating on the leaves and stems. If there is no waxy coating and the plant is not woody, best control will be obtained with water-based materials.

Although the oil-based esters in many cases are the most effective materials for the control of pasture weeds, their use is not recommended where control can be secured with water-based materials. If control of pasture weeds can be obtained with water-based materials, there is less likelihood of damage to susceptible clover species. Where the use of oil-based materials is required for annuals and taprooted perennials the following formula may be used to convert the rates of application of water-based materials recommended in Table 4 to those required for oil-based esters: 0.5lb. ester = 0.75lb. amine; these are both equal to 1lb. of the metallic salt (all expressed in lb. acid equivalent). This is so for the 2,4-D and 2,4,5-T preparations. Salts of M.C.P. are more selective than the salts of 2,4-D.

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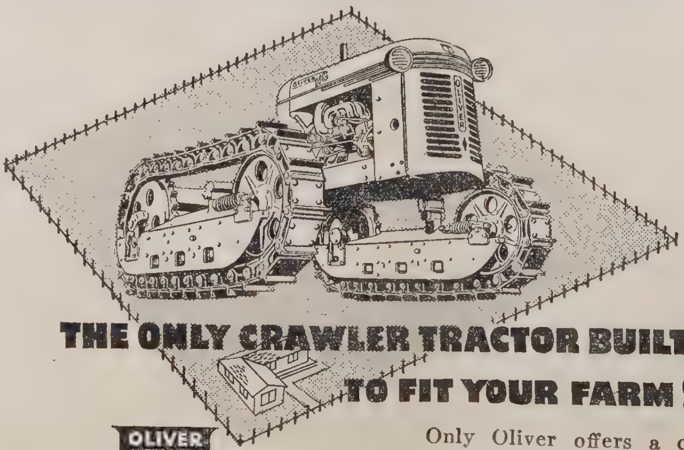

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Selection of Breeding Sows within the Herd

THE normal practice on New Zealand dairy farms for replacement of breeding sows is to save gilts for breeding from the pigs in the fattening pens. This article by A. Longwill, Superintendent of the Pig Industry, Department of Agriculture, Wellington, deals with the main points in making this selection.

The home breeder can make selection of gilts for the breeding herd from the pigs in the baconer pens. Litter records and records of weight gain and carcass quality can assist the breeder in making the selection.

MOST pig producers who breed their own pigs replace sows by selecting likely looking gilts from the baconer pens. Provided the existing breeding stock are sufficiently good and a good purebred boar has been used, there is much to be said for this method of herd replenishment. There are, however, a number of points to be watched if successful results are to be expected.

The essential qualities wanted in sows are prolificacy, good milking ability, and good mothering temperament. The progeny must be rapid growers and efficient converters of their food into meat, and the carcasses produced must be of the type to yield the maximum of high-value cuts.

The farmer who has studied the breeding of his dairy herd and methods of testing and selecting for improved performance will realise that effective methods of selection cannot be based on guesswork or even observation combined with memory, valuable as is the latter. Testing of breeding stock and careful recording of performance, if properly employed, will play a bigger part in the improvement of the general standard of performance of the breeding herds in New Zealand than any other factor.

Performance Tests

Methods of testing performance in pigs available include litter recording and carcass testing, the latter taken in conjunction with rate of growth. The operation of these schemes and their importance in pig improvement were described in the December 1951 issue of the "Journal". Though these schemes, if used intelligently, can be of assistance to the pig raiser within his own herd, considerable development, particularly of testing for efficiency of food conversion and for carcass quality under standard environmental conditions, will have to take place before the schemes can be of very great value in improving the herds of New Zealand. This is because, nationally, herds can be improved chiefly through boar selection, and it is only when the progeny of various boars can be compared under uniform conditions that a logical method of boar selection can be followed.

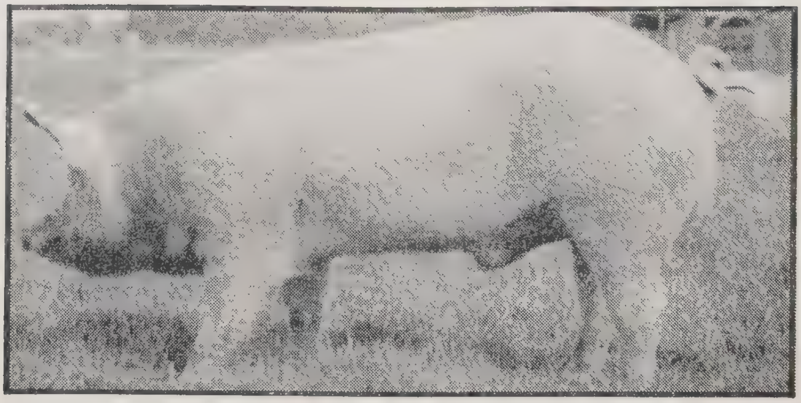
Meantime the home breeder by recording the performance of all the sows in a herd and their progeny to pork or bacon weight can use these tests to select replacement gilts. A minimum standard of performance of 9 piglets born and 8 reared with litter-recording weights of 100lb. at 3 weeks and 300lb. at 8 weeks should be set and adhered to rigidly. If this standard cannot be achieved, the existing breeding stock or the management of them is at fault and this must be remedied first. It is not a sufficient criterion for selection that a sow should have put up one litter record of this standard. A sow if reasonably well managed should show that she is capable of producing up to this standard regularly and over a long breeding life.

The additional tests of efficiency of food conversion and final carcass quality should be superimposed on the initial litter recording to give a complete picture on which to base selection. To test efficiency of feed conversion strictly it would be necessary to record carefully every pound of feed used and the gains made, but for practical purposes at the moment rate of gain can be taken as a rough guide on the farm. Rate of gain and carcass quality can be recorded through the carcass-quality evaluation scheme. Representative pigs from individual litters could also be entered in carcass competitions, when the full carcass score can be obtained.

Gilts should be selected when they are between 22 weeks and baconer weight and should be fed on to make further growth without becoming overfat.

Lifetime-performance Records

The keen breeder, particularly the pedigree breeder, could well go to the extent of keeping a lifetime-performance record for each sow in his herd. Copies of a form suitable for recording this data may be obtained from the Department of Agriculture.



Boars should be selected on the records of their parents' performance as shown by growth rate and carcass quality in previous litters.

The standards set for growth rate and carcass quality must be kept together. It is possible, for instance, to increase the carcass score at baconer weights, provided time is taken to restrict feeding, in pigs which normally would be too short and fat to make ideal baconers. To be worthy of selection for breeding a sow's progeny should make 150lb. baconer carcasses in 200 days or less and at the same time should achieve an average carcass score of 70 per cent. with as little variation as possible. Because of the seasonal nature of feed supplies in New Zealand, some latitude in interpreting such standards is necessary. The minimum carcass score of 70 should be set rigidly, however, and latitude down to a growth rate of .70lb. carcass gain per day allowed only if growth has been over a period when food supplies were inadequate. Again, a test of one litter is insufficient and it should be possible to test one litter from each sow every year under reasonably favourable feed-supply conditions.

A more satisfactory test for New Zealand conditions would be to aim for a 90lb. dressed porker in 20 weeks (140 days) with a minimum carcass score of 70. If this growth rate and carcass score is obtained, it should be possible, with careful finishing, to obtain a fairly good baconer carcass from the same strain of pigs. Breeders interested mainly in baconer production would pay special attention to individual carcass measurements, such as of length and backfat, to ensure that the pigs they selected were breeding the right type for baconer production.

Complete Recording

Those not able to undertake complete recording could use a selection technique based on the ability of pigs to grow efficiently and to produce generally good-type carcasses. The standard for growth rate could be 150lb. liveweight in 22 weeks (154 days) and that for carcass type could be set from grading results on the hooks coupled with an assessment of the animals on the hoof.

It would be a step forward if in the selection of gilts to be used for breeding home breeders added the growth-rate criterion (150lb. in 22 weeks) to the usual visual appraisal for carcass type, teat placement, feet and legs, etc. The ability to convert food rapidly and efficiently into meat is largely an inherited characteristic. The use of gilts which have shown that they have this trait and are from sows which have passed other tests outlined in this article should offer scope for improvement in the efficiency of New Zealand's breeding stock. The runt of the litter and the last pigs in the fattening house at the end of the season should not be the material from which future breeding stock is selected.

Management of Selected Gilts

Final selection should be made when gilts are between 22 weeks and the baconer stage. Gilts selected should be run out on pasture and fed to maintain growth rate without production of too much fat. Mating should take place at about 8 months, depending on the times of other farrowings and the overall fitting of pigs to the seasonal food supply. Gilts being selected from the fattening pens now should be grown on for mating in July and August to farrow in November and December. Pigs from litters born in May and June should be selected, on the criteria described, for mating in January and February to farrow at 1 year. May to June is probably the best time to bring new gilts into the herd.

As pigmeat prices are sufficiently attractive and the need and scope for increased production are clear, there should be no hesitation about increasing sow herds. Some indication of how this can be done most effectively from the existing stock on the farm has been given here; further assistance may be obtained from officers of district pig councils and from the Department of Agriculture.

Ruakura Farmers' Conference Week

AN opportunity for farmers to keep abreast of research work into farming problems is again given by the annual Ruakura Farmers' Conference Week, which is to be held at Hamilton this year from Tuesday, 13 May, to Friday, 16 May, inclusive. The chairman of the conference will be C. P. McMeekan, Superintendent of the Department of Agriculture Animal Research Station, Ruakura, in co-operation with the Waikato Farmers' Educational Committee.

The programme is well planned and comprehensive. It deals specifically as it has done in previous years with problems of sheep and dairy farmers, and a large part of the time will be devoted to a section for all farmers.

The opening day, 13 May, is set aside for the sheep farming section and will begin with a paper by Dr. McMeekan on the work at Ruakura. Other subjects are "Improvement of Pastures on Sheep Farms", "Pulpy Kidney in Lambs, Sleepy Sickness and Milk Fever in Ewes", "Dipping and Drenching", "The Place of Galloway Cattle on Hill Country", and "Diseases of Beef Cattle". An open forum will be held at the end of the day, when A. Rowlands, F. C. Johnstone, and Dr. McMeekan for the meat industry, the producer, and the research worker respectively will discuss "How Beef Output Can be Increased".

The section for all farmers extends over two days, Wednesday and Thursday, 14 and 15 May, and covers a wide range of subjects. It will begin with a field day at Ruakura and will continue with papers such as "North African Phosphate Can be Dangerous to Stock", "Eucalypts on the Farm", and "Avoidable Losses in the Meat Industry".

On the last day of the conference Friday, 16 May, problems of dairy farmers will be dealt with. Dr. McMeekan will give an address on the work at Ruakura and other subjects will be artificial insemination, lifting production in low-producing herds, the eradication of tuberculosis in dairy herds, cleaning the milking machine, and recent developments in providing an efficient testing and servicing organisation for milking machines.

Bands from Wild Ducks Wanted

DRAINAGE of swamplands in recent years has reduced steadily areas where ducks can breed in New Zealand. Many farmers maintain artificial duck ponds, but under the changed conditions these are not much use to ducks unless they are fringed with dense marsh vegetation. There are signs that farmers are appreciating increasingly the need for the presence of native swamp plants about these holes if they are to keep duck on their properties.

By banding of ducks the Wildlife Division of the Department of Internal Affairs is obtaining knowledge of how the birds react to changed conditions. The shooting season for game starts on 3 May, and the Secretary for Internal Affairs asks farmers to return any bands taken from ducks they shoot to the Controller, Wildlife Division.

Returns of bands in former years have been good. As before, each person returning a band will be given the history of the bird. Some loss of bands occurs through delay in posting them to the Wildlife Division, so the Department asks that they be returned promptly.

Winter Show Dates

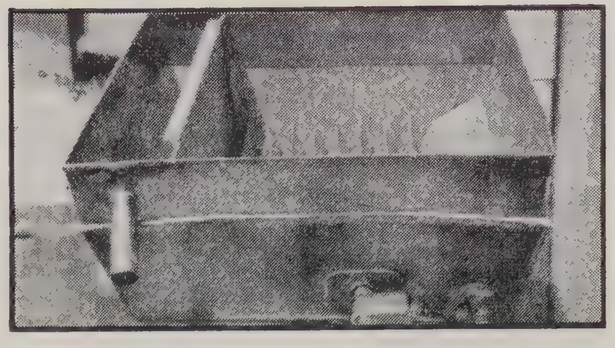
THE following are dates and venues of winter shows.

11, 12, 13, and 14 June—Taranaki Metropolitan A. and P. at New Plymouth.

24, 25, 26, 27, and 28 June—Whangarei A. and P. at Whangarei.

Design for Simply Made Honey Heater

ALMOST every beekeeper finds that some extracting must be done late in the season, but as honey is more viscous then because of lower temperatures, it is slower to extract and more difficult to strain. This article by L. H. Johnson, Apiary Instructor, Department of Agriculture, Palmerston North, describes a satisfactory heater made by Mr. E. J. Kirk, of Wanganui, by modifying a Baines cappings melter and gives constructional details of a heater of similar design which most beekeepers should be able to make themselves.



A honey heater made from a Baines cappings melter with extension to walls, baffle, outlet pipe, electric element, and thermostat.

THOUGH many appliances have been designed for heating honey as it flows from the extractor, few are efficient. Honey may be warmed without risk of deterioration if it is not exposed to too high temperatures for long periods; to speed the work up it is necessary to get all the honey to come in contact with heat quickly. The temperature of the heating surfaces should never be higher than the danger point of 160 degrees F. or the honey next to it will be impaired.

Mr. Kirk increased the holding capacity of his Baines melter by extending the side and end walls 8in. upward and he closed the ordinary honey and wax outlets. A baffle is fixed near one end so that the honey must flow underneath it and up to the outlet pipe.

The ordinary Baines melter has a water jacket, but to heat the water electrically in Mr. Kirk's melter the water compartment has been enlarged at one end to take a 1500-watt electric element and a thermostat. The water temperature can be regulated by setting the thermostat to any desired heat from 100 degrees to 150 degrees F.

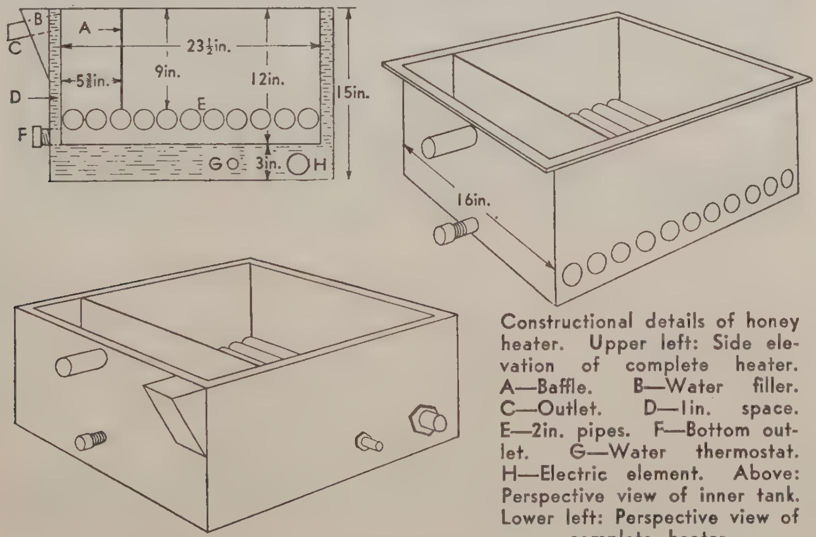
Method of Operation

The heater is set below the extractor, with the outlet away from the gate. As the honey flows from the extractor it fills the heater to near the top, where the outlet is set, and remains at that level. Particles of wax from the cappings quickly float to the top and can then be skimmed off periodically and put in with the cappings. There is no wire-mesh strainer to be continually clogged, as there are only minor impurities to be strained after the honey leaves the heater. Warmed honey flowing from the outlet pipe then easily passes through a cheese cloth or fine-wire gauze and runs into a tank, retaining its warmth long enough to permit further clarification. Warmed strained honey is also in the right condition to pass through a honey pump and to be piped to where required. This heater can cope with the honey as it flows from a 21-frame semi-radial extractor and has given satisfactory service for the past 3 years.

Alternative Design

Any beekeeper who can do simple sheet-metal work and soldering should be able to make his own heater. Unused Baines melters may not be readily available for converting into honey heaters, but the heater shown in the diagrams below embodies the same principles as Mr. Kirk's modified Baines melter. In addition to having a large heating surface, the aim is to divide the mass of honey into ribbons for quick heating. This is achieved by passing the honey over a series of 11 2in. pipes which are water heated; no honey can flow from the extractor gate to the outlet unless it passes through the spaces between the pipes, the edges of which should be ⅛in. apart. This heating process has the effect of creating a continuous film of honey ⅛in. thick by 192in. long and which passes through the spaces between the pipes.

The diagrams below show the specifications of the inner and outer tanks of the heater. For building them sheet metal (tinplate) of not less than 24-gauge thickness should be suitable; tinned copper sheet metal would be non-corrosive, but it is too soft to remain rigid.



Constructional details of honey heater. Upper left: Side elevation of complete heater. A—Baffle. B—Water filler. C—Outlet. D—1in. space. E—2in. pipes. F—Bottom outlet. G—Water thermostat. H—Electric element. Above: Perspective view of inner tank. Lower left: Perspective view of complete heater.

Inner Tank

The dimensions of the inner tank, which should be made first, are 23½in. x 16in. x 12in. deep. If the pipes are first spaced out, the exact length of the tank can be ascertained. An allowance of 1in. should be made between the bottom of the tank and the undersides of the pipes. The apertures for the pipes should be accurately marked out and cut and the pipes should be soldered from the outside.

Provision should be made for a bottom outlet so that the heater can be emptied of honey after separation has been completed. A 1½in. pipe with a screw-on cap will serve the purpose. This will also give access to the space under the pipes for cleaning with a long-handled bottle brush.

The lower edge of the top outlet should be 3in. down from the top. Fix a partition or baffle between the side walls and the top of the third pipe at about 5⅜in. from the outlet end. Make the top flange 1in. wide and turn down ½in. to fit over the outer tank.

Outer Tank

Construct the outer tank 1in. larger than the inner tank on all sides and 3in. deeper to give space for the electric element and thermostat. At one end provide a water filler. Although the flange of the inner tank will carry a considerable weight, additional studs or stays should be fixed to the inside bottom of the outer tank to prevent sagging.

A qualified electrician should connect the element and thermostat, which is a comparatively simple job.

As the outlet is less than 6in. below the extractor gate, there is little loss in height where a gravity system is used. Less heat would be required if the heater were insulated and had a movable cover on top, but as the temperature in most extracting houses is fairly warm, insulation is perhaps of less importance. When regulating the thermostat it is advisable to take frequent thermometer readings of both the water and the honey.

The appliance should be washed clean of all traces of honey after use. Otherwise corrosion may occur at any weak spots in the metal. Not only will this eat into the metal, but it will cause the affected surface to impart a bad taste to any honey which passes through it afterward. Once this corrosion has begun it is doubtful if it can be effectively arrested.

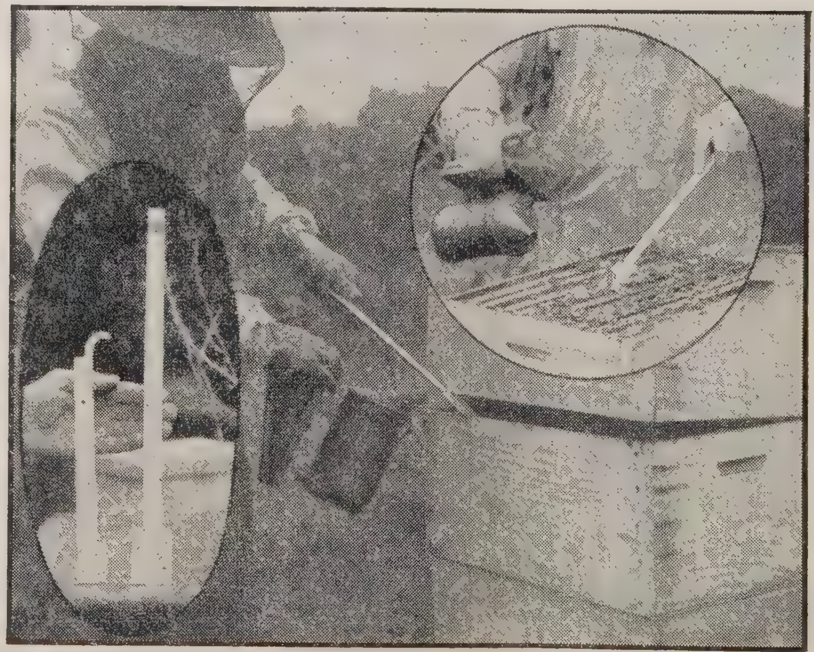
Another important safeguard against corrosion is to empty the water out of the heater as soon as work with it has been completed.

So many beekeeping appliances are designed to be operated by electric power that the producer outside a reticulated area often has to work under a disadvantage. As this is a hot-water appliance, it should also operate satisfactorily if heated by steam from a low-pressure boiler or by some type of kerosene heater placed underneath it. Frequent checking of the temperatures of the honey and water would be necessary when the heater is operated without thermostatic control of heat.

METEOROLOGICAL RECORDS FOR FEBRUARY

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
				Absolute maximum and minimum					Maximum fall		
		Approx. mean	Difference from normal	Maximum	Minimum	Total fall	No. of days of rain	Difference from normal	Amount	Date	
Kerikeri	201	68.4	+2.8	80.0	50.0	10.08	19	+5.91	1.79	2	130.6
Auckland	160	69.2	+2.5	81.8	56.0	5.64	11	+1.73	1.63	19	150.6
Tauranga	10	68.2	+3.2	79.0	48.1	2.78	10	—0.95	1.20	3	181.5
Ruakura	131	65.9	+2.6	82.1	43.7	3.25	13	+0.27	0.93	9	150.3
Rotorua	969	65.6	+2.7	82.5	45.5	5.30	16	+1.55	2.56	3	143.6
Gisborne	12	66.1	+0.5	82.1	45.5	5.29	13	+2.24	2.38	16	176.8
New Plymouth ..	160	65.0	+2.5	78.8	44.9	4.54	12	+0.56	1.14	27	167.2
Napier	5	67.0	+1.6	85.6	48.6	2.22	8	—0.46	0.93	16	177.8
Karioi	2125	61.8	+4.2	82.0	37.0	4.01	12	—0.04	1.02	9	
Wanganui	72	65.0	+1.3	81.9	45.5	2.09	15	—0.88	0.63	2	187.6
Palmerston North .	110	65.6	+3.1	81.8	49.0	1.94	10	—1.15	0.44	3	170.0
Waingawa	350	64.7	+2.3	88.0	45.0	0.94	7	—1.87	0.50	3	184.5
Wellington	415	62.6	+1.3	79.6	51.3	2.91	7	—0.37	1.02	2	167.3
Nelson	5	62.4	+1.2	76.0	39.5	4.08	6	+1.46	1.30	18	180.4
Blenheim	12	63.4	+0.1	86.9	43.5	1.18	7	—0.96	0.46	25	177.9
Hokitika	12	58.8	+0.7	73.3	40.0	12.86	13	+5.13	3.50	27	157.1
Hanmer Springs ..	1225	60.7	+1.3	87.0	35.0	1.07	7	—2.58	0.70	25	168.5
Christchurch ..	22	62.2	+1.4	85.7	41.0	0.52	6	—1.28	0.32	27	142.6
Ashburton	323	62.4	+1.4	92.2	35.4	1.09	6	—1.60	0.64	27	157.3
Timaru	56	60.2	+0.0	87.0	40.5	1.62	9	—0.60	0.79	27	151.4
Alexandra	520	62.8	+1.4	87.0	37.1	1.47	5	+0.00	1.10	1	206.5
Taieri	80	57.8	+0.1	87.8	35.2	0.87	7	—1.44	0.43	27	178.3
Invercargill ..	32	56.9	—0.4	77.0	35.0	2.35	14	—1.11	0.59	1	175.0

USES FOR A HEAVY-DUTY HIVE TOOL



THE heavy-duty hive tool illustrated has been found very useful where supers and frames have become stuck together and require levering apart. Inset at the left is shown for comparison the smaller Pender hive tool and the heavy-duty hive tool. Uses for the heavier tool are also shown. Burr comb is being removed in the inset at the right, the action being easier than with the smaller tool and the hand more removed from the bees. The body of the photograph shows the heavy-duty hive tool being used to separate supers. Use of efficient hive tools for opening up hives heavy with honey will reduce fatigue, bruising or damage to woodwork, and also the time spent with each hive.

THE length of the tool (14in. to 15in.) enables good leverage in stubborn cases, and the blade is broad enough to force an opening without spoiling the edges of the supers. It is common to see older supers with their corners and front edges so bruised that bees have easy access. In autumn, when robber bees seek out poorly defended hives, bruised or open crevices can make suppression of robbing bees difficult.

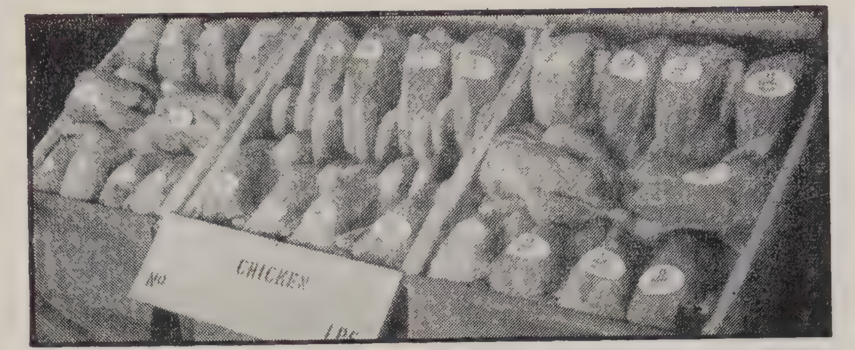
The blade of the heavy-duty tool has a shoulder on each side which can be used for loosening frames when the smaller Pender hive tool is not on hand for the lighter work. The blade is about 2½in. long and 1½in. wide so that it can be used to clear burr comb from inner walls of supers. It may be worked freely up and down in the space where a frame has been removed. Because of the strain this tool is put to it is desirable to get a blacksmith or engineer to make it out of approximately ¼in. spring steel or to temper the metal for heavy work. The top end of the handle should be shaped to form a circle or scroll and the handle enamelled white to prevent it being lost in long grass. If the tool is made out of a large flat file, the serrated surface should be smoothed off, for it could harbour the bacillus of foul-brood.

—*S. LINE, Apiary Instructor,*
Department of Agriculture,
Invercargill

Photographs by Commercial Studios.

Fattening, Killing, and Plucking Table Poultry

FATTENING, the last stage in the production of table poultry before the birds are killed and processed, is discussed in this article, the third of a series by F. C. Bobby, Superintendent, Poultry Industry, Department of Agriculture, Wellington. Methods of killing and plucking are described, and emphasis is placed on the need to carry out these processes correctly if the birds are to be marketed in an attractive and appetising condition. Trussing will be the subject of another article to be published later.



[Green and Hahn Photography Ltd. photo.

Boxes of table poultry processed, graded, and packed for the market.

GOOD FEEDING and sound management are essential for birds intended for the table, because the frame is formed and fleshed during the rearing and growing period. Fattening, on the other hand, is the final stage before killing and covers a comparatively short period. Until this final stage is reached no special method of feeding is called for. A good chick mash forms a suitable diet during the brooding period, and a growers' mash can be fed up to the time for fattening provided it is not unduly bulky because of the use of large proportions of bran and pollard. In previous years only an excess of bran need have been guarded against, but the carbohydrate content of pollard is now so low that this meal too must be used in moderation.

A table bird must be well fleshed by the time it reaches the fattening stage. Fattening will not necessarily put breast meat on a bird, its real objects being to put fat on the bird and to improve the quality of the flesh. A well-fattened bird has increased fat under the skin on the breast and around the pelvic bones which melts during cooking and permeates the flesh, making it more succulent and tender.

Two methods of fattening poultry are commonly recognised—trough feeding straight off the run or after the growing period and trough feeding followed by cramming. As it is doubtful whether trough feeding and cramming (a system of mechanical forced feeding) would be economical in New Zealand, only the trough feeding method will be described. Cramming table birds with a cramming machine in common use in England requires particular skill. The mechanical operation of cramming is not unduly difficult, but skill is required in mixing the correct type of food and in judging how long a bird is to be crammed.

Essentials of Fattening

Fattening by trough feeding has four important aspects—when to start fattening, limiting the birds' activity, the class of food to use, and the length of the fattening period. The primary object in table-bird production is to obtain quantity with quality, and not quantity at the expense of quality. After the growing stage quality slowly deteriorates both in cockerels and, more slowly, in pullets. The extreme case is the fully-developed breeding male after the breeding season; such a bird, often referred to as a "stag", has little or no value as a table bird. In both cockerels and pullets to be reared for the table the end of the breast bone should be soft and pliable; that is, it is still gristle and has not become bone, which is hard and rigid. Cockerels should show no development of the spurs.

With heavy-breed birds (light breeds are not recommended for fattening) and first crosses of which one parent at least is a heavy breed fattening may start between 16 and 18 weeks. The exact age will depend on the breed and how well the birds have been reared and grown.

During the period of fattening birds should be strictly confined; cages or fattening crates similar to an average broody coop for, say, 6 birds are best for this purpose. Birds may be fattened on the floor in an intensive house, but it is strongly recommended that they be in units not exceeding 20 to 30 if this method is adopted. Cages or coops are preferable to a pen for fattening.

Rations for Fattening

Feeding is restricted to a semi-fluid mash given twice daily. Water is not necessary. The change from ordinary feeding is made after the birds have been starved for 24 hours, which brings them to the new method of feeding with a keen appetite. The essentials of a fattening ration are milk and a finely ground meal containing a high percentage of carbohydrate or starch. The milk may be buttermilk, skimmed milk, or dried skimmed-milk powder. Maize, oats, and barley all provide valuable meals for fattening, but oat or barley meal must be of high bushel weight and finely ground.

Two mashes suitable for fattening are: 50lb. of maize meal, 25lb. of oatmeal, 20lb. of barley meal, and 5lb. of dried skimmed-milk powder; or 50lb. of maize meal, 30lb. of oatmeal, and 20lb. of barley meal mixed with buttermilk or liquid skimmed milk at the rate of 10lb. (1 gallon) to 100lb. of mash. The mash should be sufficiently liquid to permit its being poured slowly from a bucket or watering can. The first ration should be mixed with water to this consistency and water added to the second, after the liquid milk has been mixed in, until the correct consistency is attained.

The birds should be given as much as they will eat at each of the two daily meals, but any that is left should be removed as soon as the birds turn away from the troughs. Cleanliness of the troughs is important, particularly if liquid buttermilk or skimmed-milk is used. Sour troughs with an objectionable smell quickly reduce the birds' appetites.

If good samples of oats or barley cannot be procured, maize meal and wheat meal may be used with a milk product.

Length of Fattening Period

Trough feeding should last for 14 to 18 days. How long the birds will feed readily will depend largely on the palatability of the ration, the consistency of the mash, and the health of the birds. As soon as their appetites are seen to be falling off appreciably the birds should be killed, for when appetites fail body weight can be lost rapidly.

With the rations recommended heavy-breed birds should gain about ½lb. during the fattening period and improve considerably in quality of flesh. Milk products are particularly valuable for improving quality.

Before the birds are killed they should be starved for 12 hours to empty the intestines. At one time 24 hours' starvation was considered desirable, but recent studies of this aspect of fattening indicate that this results in an unnecessary loss of weight. On the other hand, birds killed soon after being fed are more likely to turn green round the vent while being held before being processed, particularly during hot weather.

Methods of Killing

A bird may be killed by dislocating the neck or by severing the jugular vein and allowing the bird to bleed. The old-fashioned method of cutting off the head is unpleasant and messy.

Whether the bird is to be plucked dry or wet, dislocation of the neck is satisfactory, provided that a definite break is made and a gap of up to 2in. is formed in the spinal column into which the blood may drain and clot when the bird is hung up by the feet or held head down in a metal funnel. Draining of the blood from the body into the neck is essential to prevent

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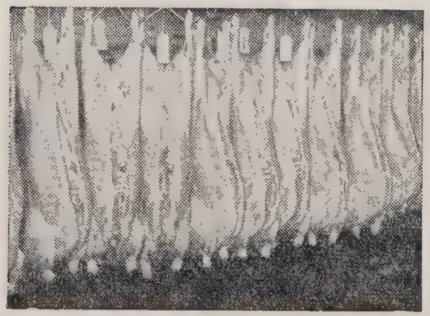

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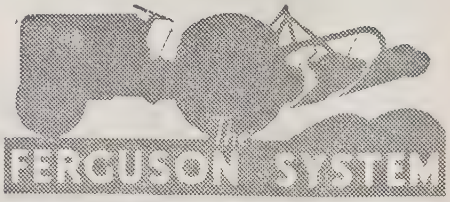

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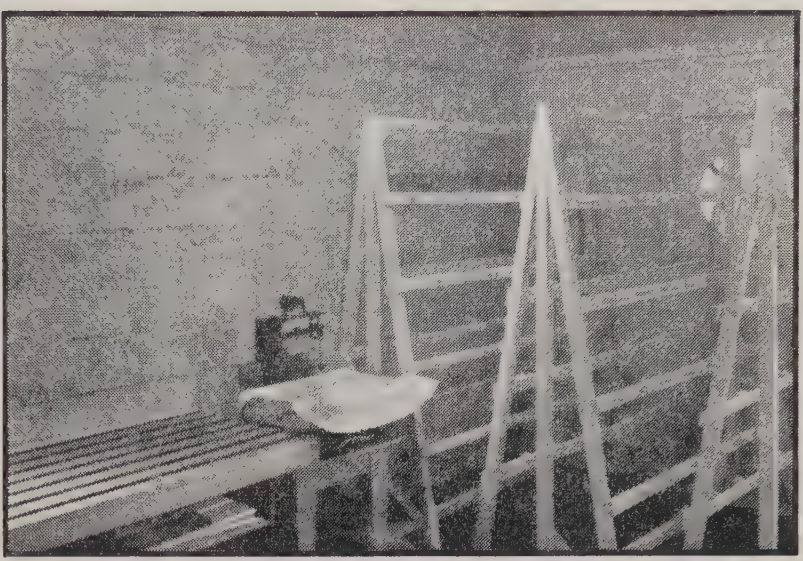


A poultry-packing room, with racks for holding the birds before they are packed and, in the rear wall, an inlet fan for cooling.

discoloration of the flesh on the breast. Unless all the blood is drained from a bird after it has been killed the appearance is depreciated considerably.

Severing of the jugular vein can be accomplished by inserting a pointed, narrow-bladed knife into the throat. The bird becomes unconscious, after which all the blood is drained from the body. If properly carried out, this method leaves the bird with flesh of a better colour than if the neck had been dislocated.

Dry plucking after severance of the jugular vein is accelerated considerably by insertion of the knife through the slit in the top of the mouth toward the back of the skull. A small twist of the knife destroys the nerves where the brain connects with the spinal column in the neck, causing the feathers on the body to loosen immediately. Care should be taken not to damage the brain in the front and centre of the skull, as the effect is to tighten the feathers and to make plucking more difficult. This operation is not necessary where wet plucking is used.

Dry and Wet Plucking

Dry plucking has been practised for centuries. A reasonably quick process in the hands of the skilled operator, particularly with discarded pullets or hens, it can be slow, tedious, and not particularly successful in the hands of a novice, particularly with a chicken, which tears easily on the feather tracts on the lower part of the neck and front of the breast.

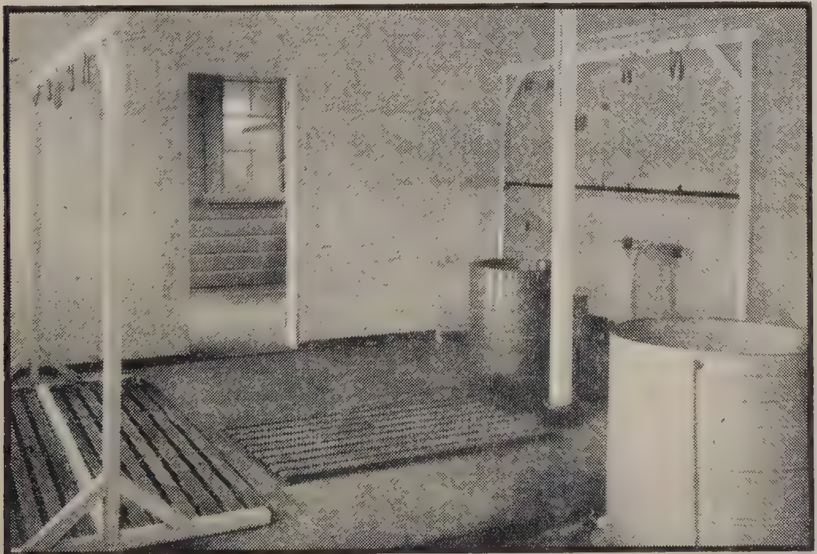
The trend now is toward wet plucking because it is easier and quicker. Either of two methods may be used—hard scalding or semi-scalding. Hard-scalded birds may be stripped of feathers while lying on a hardwood or metal table; semi-scalded birds are often plucked while hanging up.

Hard Scalding

The bird is plunged into and swirled around in water between 180 and 190 degrees F. for just long enough to loosen the feathers by cooking the muscles in the feather follicles. The feathers are then released and can be removed very easily. If the colour of the comb and legs is to be retained, the head and legs should not be immersed.

This method of scalding can easily damage the protective skin, with the result that discoloured, blotchy areas appear as the bird dries. These areas become most pronounced if the bird is subsequently placed in cold store, the appearance of the bird being affected seriously. It is also claimed that hard scalding is detrimental to the keeping quality of a bird because it damages the outer protective skin.

Because of these disadvantages the trend is toward the second method for commercial purposes.



A poultry-killing room, with tanks of hot water for semi-scalding and cold water for cooling the birds. The birds are hung on the hooks on the right for sticking and bleeding and on those on the left for wet plucking.

Semi-scalding

The water used is lower in temperature and immersion is for a definite period, according to the class of bird. This method has the advantage that the protective skin is not damaged readily during the removal of the feathers, resulting in a bird in as good a condition as one that has been dry plucked. Plucking after semi-scalding is more rapid than dry plucking, but not quite as easy as with hard scalding.

The water temperature recommended is 128 to 130 degrees F. with an immersion period of 30 seconds or 122 to 127 degrees for 90 seconds. Adult birds will stand 130 degrees for longer than 30 seconds, but birds younger than 16 weeks should be given the lower temperature for not longer than 30 seconds. Temperature and immersion time should be carefully controlled for best appearance of the final products. Birds plucked by this method may be cold stored with less rapid deterioration in keeping quality than in hard-scalded birds.

Cooling

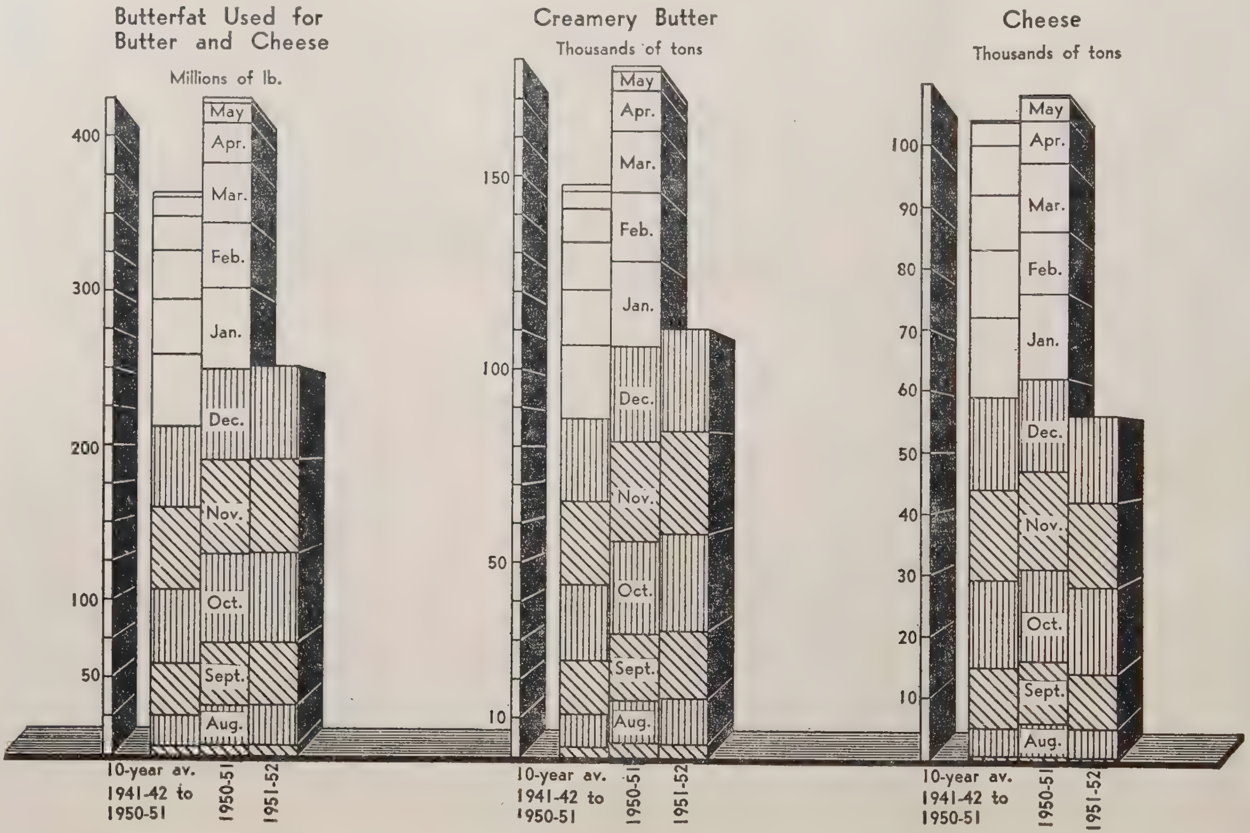
To prevent bacteria causing decomposition, particularly in the region of the vent, a bird must be cooled as quickly as possible after being plucked. Cooling is desirable even if the bird is to be trussed soon after being killed, as a cleaner job can be made of trussing when the fat has set. With a bird killed by dislocation of the neck this is more important still, as it is desirable for the blood to clot fully if trussing is to be clean.

During cold weather birds can be cooled on racks in fan-circulated air, but cooling is most effective and rapid in a cool room with a temperature of 32 to 34 degrees F. If a special room is not available in summer, birds may be cooled by immersion in cold water for 6 to 10 hours, depending on the temperature of the water. Proper cooling is essential for birds to be packed for market.

Photographs on this page by Photo News Ltd.

Butterfat Production for 1951-52 Expected to be a Record

THE amount of butterfat produced in the 1951-52 season is likely to exceed 500,000,000lb. "at the pail", breaking last season's record of 499,000,000lb. The diagram below, which is based on data supplied by the Statistical Section, Extension Division, Department of Agriculture, Wellington, shows that production in the first 6 months of the season has exceeded that of the equivalent periods of both the 10-year average and last season for butterfat received at factories for the production of butter and cheese and also for butter manufactured.



The increase amounts to more than 1 per cent. on last year's figures and about 19 per cent. on those of the 10-year average for butterfat received at factories and used for butter and cheese manufacture. Compared with last season's output, butter production is up by 4.4 per cent. for the 6 months, but cheese production is more than proportionally down, the decrease recorded amounting to more than 10 per cent.

This is partly the result of a slight seasonal drop in production in some of the cheese-producing districts, but has mainly been caused by a change-over from cheese to casein production. Cream from whole-milk supplied to casein-producing factories is diverted to butter manufacture, but as relatively less butter than cheese is produced from this diversion and as the butter industry is larger than the cheese industry, the percentage decrease in cheese shows as a larger proportion than the gain to butter.

The best indication of farm production is the amount of butterfat processed by factories. About 85 per cent. of butterfat produced "at the pail" is used by butter and cheese factories. Factory intake of butterfat for each of the first 6 months of this season has exceeded the monthly totals in the same period of last season except for July and November, when the figures were slightly lower. The net increase for the 6 months is 2,600,000lb. The figure for December 1951 (60,800,000lb.) was slightly higher than that for November 1951 and more than 2,000,000lb. higher than that for December 1950.

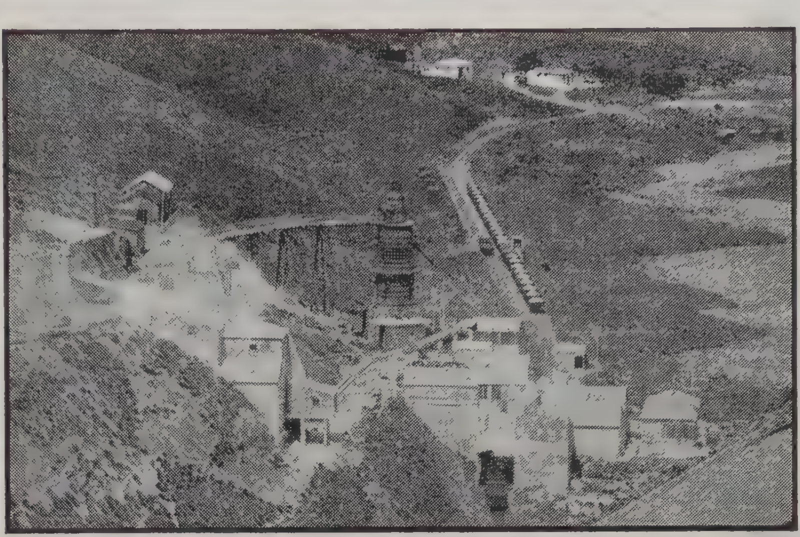
Although official figures for 1951 are not yet available, it is estimated that the number of cows in milk is still increasing. This, combined with a generally favourable growing season, more particularly during the summer, has contributed to the large production so far recorded.

Rainfall in January was well maintained and figures at present available indicate that the gains recorded up to December will be increased further. Normal dry conditions prevailed in February, but there have been no serious dry spells in any districts. With the bulk of the season's production in hand the present increases should be maintained if no exceptional conditions are experienced late in the season.

The increasing population of the Dominion is absorbing a larger volume of liquid-milk products, which are the second largest item in butterfat utilisation. Returns from processed-milk factories also show a slight increase in butterfat utilisation for whole-milk powders, condensed and evaporated milks, and allied products.

Agricultural Value of Burnt Lime

BURNT lime is made in New Zealand principally for preparing lime mortar and as an industrial chemical. Ground burnt lime sold for agricultural purposes is in many instances a second-grade product and its liming value is often no better than that of ground limestone. D. F. Waters, Senior Agricultural Chemist, Rukuhia Soil Research Station, Department of Agriculture, Hamilton, here gives the reasons for the poor quality of burnt lime and describes the differences in the various forms of lime.


Limeworks with kiln at Dunback, Otago.

THE value of lime in agriculture is widely appreciated, but not all farmers are aware of the essential differences between the forms of lime available from merchants. For soil treatment lime may be broadly defined as a compound of the element calcium which will reduce soil acidity. Many other chemicals would neutralise acidity, but the value of lime lies in its wide occurrence, its cheapness, and most of all in the fact that calcium is necessary in the soil as a plant nutrient. In applying lime the farmer is adding calcium as well as correcting soil acidity. The common forms of lime which have these properties are:—

Limestone (calcium carbonate), which occurs naturally and is ground and sold as agricultural lime;

Burnt lime (calcium oxide), produced by burning limestone and sold under various names such as burnt lime, quicklime, burnt shell lime, and Roche lime;

Slaked lime (calcium hydroxide), produced by the addition of water to burnt lime, and sold as hydrated or builders' lime.

Burning

When limestone is to be burnt a mixture of coal and limestone rock fragments is loaded into the top of a vertical kiln. As the charge slowly sinks it burns about half-way down and the heat produced breaks up the calcium carbonate into calcium oxide and carbon dioxide, which is carried away in the flue gases. Burnt stone is removed from an opening in the bottom of the kiln at such a rate that passage of the charge through the kiln takes from 2 to 4 days. Unless a modern kiln is used, the burnt stone will not be of the uniformly high grade which commands a good price for industrial purposes. Accordingly the stone is picked over by an experienced operator who selects the lighter, well-burnt stone to be packed for industry. The heavier pieces will consist of unburnt and partly burnt stone with hard-burnt stone. The last-named is stone which has been subjected to excessive heat and changed to a dense, partly fused rock which will not slake readily. These rejected pieces with smaller fragments of burnt stone are ground and bagged as agricultural burnt lime.

Agricultural Use

When burnt lime is slaked by the addition of a small amount of water or by exposure to damp air, each lump swells, heats considerably, and falls away to a fine powder of slaked lime or calcium hydroxide. The whole process of burning followed by slaking was for centuries the most common method of reducing limestone to a fine condition for application to the soil. The extreme fineness of slaked lime permits thorough incorporation with the soil and as it is alkaline, it immediately neutralises soil acidity. Carbonate of lime and burnt lime have the same action in the soil; in fact burnt lime slakes and becomes carbonate rapidly. The advantage of burnt lime for agricultural purposes should be its high content of calcium oxide.

CONSTITUENTS OF BURNT LIME SAMPLES

Type	1 True burnt lime (per cent.)	2 Hard-burnt lime (per cent.)	3 Calcium oxide in unburnt limestone (per cent.)	4 Limestone unburnt (per cent.)	5 Liming value of sample as carbonate of lime
NORTH ISLAND					
Burnt lime	52.5	10.0	14.2	25.4	137
Burnt lime	56.6	9.5	10.8	19.3	137
Hydrated lime	(= 49.2)	6.5	9.0	16.0	119
Agricultural burnt	8.2	2.9	39.5	70.5	90
Agricultural burnt	13.3	3.0	38.8	69.3	98
Agricultural burnt	9.4	19.0	19.6	35.0	86
Agricultural burnt	29.0	12.0	14.5	25.9	99
Agricultural burnt	30.4	14.1	14.5	25.9	105
SOUTH ISLAND					
Burnt lime	52.6	19.2	0.7	1.2	129
Burnt lime	69.6	2.4	4.5	8.1	137
Burnt lime	71.0	7.1	4.4	7.8	147
Burnt lime	79.0	10.5	1.0	1.8	161
Burnt lime	85.2	1.3	0.9	1.6	156
Hydrated lime	(= 63.1)	2.7	2.7	1.8	122
Agricultural burnt	49.4	7.0	13.7	24.4	125
Agricultural burnt	21.4	4.1	32.4	57.9	103
Agricultural burnt	30.0	5.6	25.7	45.9	109
Agricultural burnt	57.0	7.7	5.8	10.4	126

The difference between burnt and unburnt lime can be illustrated by taking two 100lb. samples of limestone, each containing 100 per cent. of carbonate, and burning one sample perfectly. The burning drives off the carbon dioxide and reduces the weight of the sample by about 44lb., though the bulk remains about the same. The residue of burnt lime, weighing about 56lb., has the same acidity-neutralising power as the 100lb. of unburnt lime. In theory it should therefore be possible to effect about 44 per cent. savings in freight and spreading costs by using burnt lime instead of crushed carbonate. Actually, however, most of the ground burnt lime sold for agricultural purposes originally contains considerably less than 100 per cent. of carbonate and is then so imperfectly burnt that it contains only about the same percentage of calcium oxide as does a good specimen of unburnt limestone. In practice, therefore, there is very little saving in freight.

In recent years samples of burnt limes produced for industrial and agricultural purposes have been analysed. The results of the analysis are expressed as percentages of the important constituents in each sample in the table on this page.

Discussion on Table

Burnt lime: A pure burnt lime would contain 100 per cent. of calcium oxide, while a commercial product made from high-grade limestone could be expected to contain about 80 to 90

290—VALUE OF BURNT LIME . . .

per cent. Only two samples tested, the burnt lime contents of which are recorded in column 1, could be regarded as first-quality burnt lime for industrial purposes. Hydrated lime, because of the added water, would contain not more than 75 per cent. of calcium oxide, and the sample containing 63 per cent. is therefore quite satisfactory.

Hard-burnt lime: Such lime is useless for industrial purposes, but being slowly soluble in the soil is still useful for agricultural purposes. Only a modern kiln under close supervision can be expected to produce a uniformly well-burnt lime without over-burning some of the rock.

Unburnt limestone: If there is insufficient heat and time for each piece of rock to be calcined completely, a core of unburnt rock will remain as carbonate of lime. The calcium oxide content of unburnt stone found in the samples is given in column 3. The actual percentage of carbonate of lime found is given in column 4. In samples giving a high percentage of carbonate and low burnt and hard-burnt lime figures evidently the time and temperature of burning were quite inadequate. Where carbonate and hard-burnt lime are both high the cause is probably the use of high temperature for a short time. A similar product would be left by taking out well-burnt stone for industry.

Importance of Calcium Oxide

For general agricultural purposes the value of a liming material depends on the total calcium oxide present, that is, the sum of columns 1, 2, and 3. Instead of the total calcium oxide, column 5 gives its equivalent as carbonate of lime, which permits a direct comparison of liming value with limestone. It is evident from column 5 that the industrial burnt limes have appreciably greater liming value than agricultural lime. The burnt limes sold for agricultural use, however, are only a little better (one is even poorer) than high-grade agricultural lime. A high-grade agricultural lime would contain about 90 per cent. of calcium carbonate, and column 5 shows several limes ranging from 86 to 105 per cent. of carbonate.

The current market prices for the various lime products show that although there is not a great difference in liming value between good, well-ground, unburnt limestone and the material that is sold as ground burnt agricultural lime under various names, the difference in price in favour of the former is so great that there can be no question that the unburnt limestone is by far the most economical liming material available to the farmers of New Zealand.

CHANGES OF ADDRESS OF "JOURNAL" SUBSCRIBERS

To ensure continuity of delivery of issues of "The New Zealand Journal of Agriculture", subscribers are required to give 4 weeks' notice of change of address. The old address (preferably an address label clipped from a recent "Journal" envelope or wrapper) and the new address should be sent to the nearest office of the Department of Agriculture.

Spring Oversowing with Clover on Raetihi Hill Country

By A. A. DUNCAN, Instructor in Agriculture, Department of Agriculture, Wanganui

OVERSOWING with clover in spring on the Raetihi hill country is good practice if Certified white clover is used and 2 to 3cwt. of phosphate is applied with the oversowing. *Lotus major* can be added with advantage to the white clover on the damper and shadier locations.

THESE recommendations arise from trials put down in the Pipiriki road district on an area typical of the moderately steep ash-covered hill country immediately west of Raetihi. This country has an elevation of 1600ft. and an annual rainfall of 63in. The pasture is dominantly browntop but includes danthonia, Yorkshire fog, sweet vernal, flat weeds, suckling clover, some crested dogstail, and a trace of white clover.

Phosphate the Dominant Factor

Topdressing with phosphate was by far the more dominant factor in the promotion of a higher-producing sward and even when oversowing was not carried out application of phosphate brought about a useful measure of improvement.

The clovers and seeding rates used were:—

	lb. per acre
Subterranean clover . .	3
Certified white clover . .	2
Kentish white clover . .	2
Montgomery red clover . .	3
Lotus major	½

The subterranean clover was a 50-50 mixture of the Tallarook and Mt. Barker strains.

Kentish white clover is a less vigorous type than Certified white clover and it was included to see whether it would establish better than white clover under relatively hard conditions.

The clovers were oversown in September and October on both sunny and shady hill slopes with and without phosphate and with and without lime. A further series of plots had an identical manurial treatment, but were not oversown with clover. This gave the following combinations:—

Oversown clover,

Oversown clover plus 3cwt. of phosphate,

Oversown clover plus 5cwt. of lime,

Oversown clover plus 3cwt. of phosphate and 5cwt. of lime,

Phosphate (3cwt.) without oversown clover,

Lime (5cwt.) without oversown clover, and

Phosphate (3cwt.) plus 5cwt. of lime (without oversown clover).

Indications from Trials

The results from the trials indicated that:—

Establishment of subterranean clover from September and October sowings was poor and did not warrant the cost of the seed. This pertained to both shady and sunny faces.

Certified white clover gave the best results over all plots. It produced good leaf and root development on both shady and sunny aspects.

Kentish white clover gave as good an establishment as Certified white clover but did not subsequently play as valuable a part in the pasture.

Montgomery red clover established quite well, but at no stage did the individual plants display vigour comparable to that of white clover.

Lotus major germinated well on the shady faces, where it continued to play a useful part in the sward. It was not a success on the drier, sunny slopes.

Application of phosphate was essential for the successful establishment of the oversown clovers. The plots where clovers were oversown without phosphate were essentially identical with the surrounding untreated pasture.

Topdressing with phosphate, without oversowing, markedly increased the suckling clover content and brought in a useful amount of volunteer white clover.

Application of lime did not result in any better establishment of the oversown clovers.

New Bulletin on Sheep Feeding in Canterbury

Canterbury has a balanced and well-developed sheep industry based on store-sheep production on the hill country and fat-lamb production on the plains. More than 5,000,000 sheep are carried, producing about 50,000,000lb. of wool and 2,500,000 fat lambs a year. In this state of high productivity feeding is the most important factor, and that is why every sheep farmer in the province will find much to interest and enlighten him, and perhaps to surprise him, in a new Department of Agriculture bulletin, "Sheep Feeding in Canterbury". The authority is I. E. Coop, Professor of Animal Husbandry at Canterbury Agricultural College, Lincoln.

A century of farming in Canterbury has been responsible for an accumulation of practical knowledge on sheep feeding, and to this knowledge has been added the results of experimental work carried out during the past 10 years by the Department of Agriculture and Lincoln College at the Kirwee experimental farm and at the college. In its three sections dealing with the feeding of breeding ewes, the fattening of weaned lambs, and the rearing of ewe hoggets, this bulletin represents an attempt to weld together information from the two sources.

Bulletin No. 355, "Sheep Feeding in Canterbury", is obtainable free from any office of the Department of Agriculture.

Culture of Feijoa Trees

IN recent years several sub-tropical fruits have been grown and marketed in New Zealand. Among them is the feijoa, sometimes called the New Zealand banana, a fruit which ripens in late autumn, when little other fresh fruit is available. Apart from the useful fruit it bears, the feijoa is proving very popular as a hedge or for an ornamental driveway. The culture of the trees is described in this article by F. L. Bailey, Orchard Instructor, Department of Agriculture, Tauranga. The fruit may be used for a variety of culinary and dessert purposes, some recipes for which are given in an article on page 336.

THE feijoa (*Feijoa sellowiana* Berg.) belongs to the botanical order *Myrtaceae*, a family of plants in which many of the species are noted for their pleasant aroma. It grows naturally in the sub-tropical regions of South America, where it thrives in a climate free from great extremes of temperature and having an annual rainfall of 30 to 40in. Edouard André, a noted French horticulturist, on his return to France in 1890 from a visit to South America introduced the feijoa to the French Riviera. There it grew and fruited remarkably well, and it was introduced later to the United States of America and other parts of the world.

Cultivation in New Zealand

One of the earliest records of the introduction of the feijoa into New Zealand was about 1908, when an Auckland nurseryman in business at that time imported plants from Australia. It was not until about 1930, however, that it came into prominence, when the plant was advertised by nurserymen as an ornamental evergreen tree. It was described as growing to about 15ft. high with colourful red and white blossoms resembling those of the pohutukawa, and having attractive green foliage with a silvery undersurface and bearing a useful fruit. At first the feijoa was planted more as an ornamental novelty than as a commercial proposition. With the improvement by selection in quality and size of fruit and the propagation of named varieties small commercial plantings have been made in New Zealand, mostly in the citrus-growing districts of the North Island in conjunction with other sub-tropical fruits.

The profitable life of a tree is difficult to estimate, for so far it appears that no insect pests or diseases have been recorded which cause structural damage to the species. In isolated instances very old trees are growing in parts of the Bay of Plenty which have received little cultural or manurial attention and they continue to bear satisfactory crops of fruit. From the evidence available it seems that the feijoa is not short lived and will grow and bear fruit for many years without special attention.

The Fruit

The variation in the size and shape of the fruit from seedling trees is considerable, but from the so-called varieties the bulk of fruit is usually more uniform in appearance. On the tree the fruit is green overspread with a whitish bloom, but it becomes yellowish green sometimes accompanied by bronze markings when ripe. The skin is thin and encloses a layer of whitish granular flesh about ¼in. thick which surrounds a translucent jelly-like pulp where small seeds are embedded. When ripe the fruit has a characteristic aroma and a delicate flavour claimed to resemble pineapple and strawberry; in New Zealand it is sometimes referred to as the New Zealand banana. It may be eaten raw, cut up and used in fresh fruit salads, preserved by bottling, or used for making jam. Fruit of the Coolidgei, a named variety, has been found to have a very high vitamin C content. That is not the case with all feijoa fruits, as, from tests carried out for vitamin C content, it is apparent that fruits from some seedlings contain a relatively low percentage.

HEADING PHOTOGRAPH: Feijoa trees are popular for an ornamental driveway. Rendell's Photo Service photo.

[*Sparrow Industrial Pictures Ltd. photo.*
Blossoms and foliage of the feijoa.

Location

The feijoa is commonly called a sub-tropical fruit, which gives the impression that it can be grown only in a warm climate. The plant actually is hardy, for it has been known to withstand 20 degrees of frost without injury. It also resists winds remarkably well and has been used frequently for shelter purposes in many parts of the Auckland Province in orchards and domestic gardens where low-growing windbreaks are required.

It thrives best in a mild climate free from excessive humidity and high temperatures and having an annual rainfall of between 30 and 40in. At present the fruit is grown commercially in the Kerikeri, Auckland, and Tauranga districts, which are regarded as the sub-tropical fruit-growing areas of New Zealand. Owing to the hardiness of the plant there appears no reason why it should not be grown commercially in other recognised fruit-growing districts where climatic conditions in winter are not excessively severe. In home gardens it should be possible to grow feijoas in most places in New Zealand with the probable exception of those which have a wet climate or unsuitable soil conditions

Soil

A good sandy loam rich in humus is very suitable for growing feijoas. They may be grown successfully also on clay soils which have been improved by the addition of humus; that may be done by sowing cover crops such as lupins or oats, which should be turned under when ready. Heavy soils which waterlog during wet spells should be avoided, as the feijoa will not tolerate "wet feet".

A warm aspect is desirable, but the situation seems to be of little importance provided the soil is well drained.

Shelter

In New Zealand usually small areas are grown as an adjunct to citrus and other sub-tropical fruits or on small holdings growing miscellaneous horticultural crops. Although the plants resist winds well, they grow and produce better-quality fruit if in a sheltered position. The provision of shelter in most cases is of little importance, because feijoas, being a minor crop, receive sufficient shelter from the crop established for the main horticultural undertaking. Unlike other sub-tropical fruits they may be planted to advantage on the more exposed portions of a grower's holding.

Varieties

Most of the feijoa trees planted in New Zealand have been raised from seed, and the seedlings have produced fruit which has shown great variability in size and shape. Little information has been recorded about the importation of named varieties of feijoas into New Zealand, but it is known that a single tree each of the varieties Coolidgei, Choiceana, and Superba were imported by an Auckland nurseryman some years ago. The Coolidgei and Choiceana trees are still growing and fruit annually, but the Superba tree died at an early age before fruiting.

A large number of seedlings were raised from seed of the imported Choiceana, and it appears that from the progeny of that variety four trees were selected because of their desirable qualities and each given a variety name. The names are Coolidgei, Superba, Triumph, and Mammoth.

The name Superba was given to one of the seedlings because the fruit corresponded with the description of that variety in overseas catalogues.

For commercial planting it is now customary to propagate the so-called varieties vegetatively; details are dealt with later in this article.

The table below gives a short description of each variety at present offered for sale by nurserymen.

The pollination requirements of different plants vary. Some are said to be self-sterile and others self-fertile. As no definite information on this aspect can be given, it is advisable to plant several plants or varieties together to ensure adequate pollination. It has been asserted that the variety Coolidgei is self-fertile, since isolated trees are known to have borne regularly.

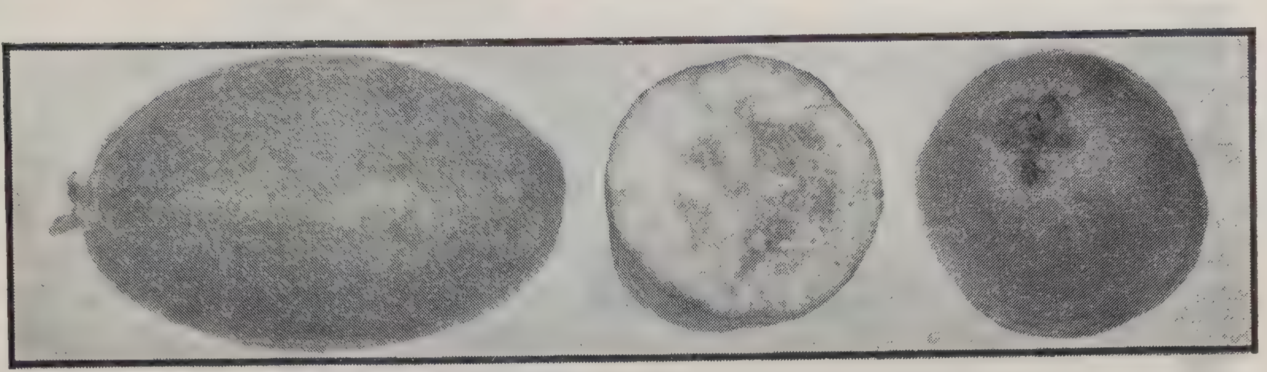
Propagation

For successful commercial fruit production it is essential that all trees planted should bear regular crops of fruit of a size and type desired by the market. Seedling trees do not fulfil these conditions satisfactorily, as observations of plants so raised have indicated that there is too much variation both of size and shape in the fruit.

The most reliable method of raising young trees is to propagate them vegetatively. That may be done by striking cuttings, by layering, or by grafting on to seedling stocks. Whatever method of propagation is used, trees bearing desirable, well-shaped fruit should always be selected from which to take propagating wood.

VARIETIES OF FEIJOAS

Variety	Tree growth	Fruit shape	Fruit epidermis	Size
Coolidgei (imported)	Strong, upright	Oblong	Moderately crinkled	Medium
Coolidgei (N.Z. raised)	Strong, upright	Oblong to elongated	Moderately crinkled	Medium
Choiceana (imported)	Medium, spreading	Spherical to oval	Moderately smooth	Medium to small
Superba (N.Z. raised)	Medium, spreading and straggly	Spherical to slightly oval	Moderately smooth	Medium to small
Triumph (N.Z. raised)	Medium, upright	Short,oval, and plump, less pointed than Coolidgei	Smooth	Medium to large
Mammoth (N.Z. raised)	Strong, upright	Oval, similar to imported strain of Coolidgei	Moderately wrinkled	Large (up to 8½oz.)



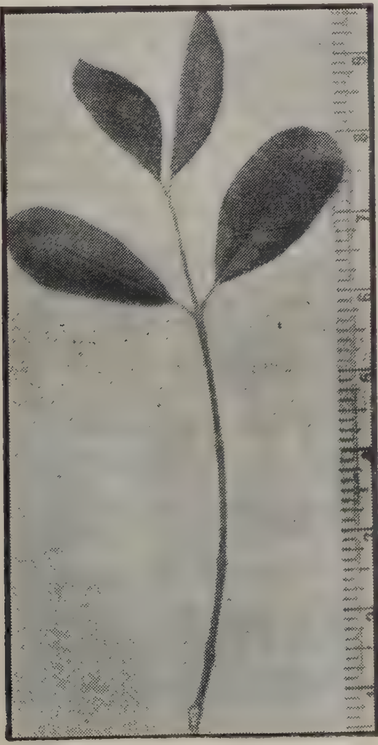
[*Sparrow Industrial Pictures Ltd. photo*

Fruits (about two-thirds actual size) of the Mammoth variety, showing cross-section of fruit and its calyx.

Cuttings

To raise trees from cuttings, lateral growth 4 to 8in. long should be selected, and with a downward pressure of the thumb at the base of the lateral it should be removed from the parent tree with a "heel". Thin laterals produced on the lower and shaded parts of the parent tree seem to root more readily than the more sturdy shoots growing on the exposed upper portions. The cuttings are not shortened and from 2 to 6 of the end leaves are left attached.

In northern districts the cuttings root readily when planted during any of the winter months, but in the more southern districts it is advisable to plant in late autumn or early winter before the onset of cold weather to secure satisfactory rooting.



[*Rendell's Photo Service photo.*

Lateral with "heel" suitable for propagating.

Light sandy loam which has free drainage is the best soil in which to strike the cuttings. The nursery bed should be located in a sunny, well-sheltered position and the soil should be well worked before planting. A mixture of equal parts of superphosphate and blood and bone applied at the rate of ¼lb. a square yard to the nursery bed will assist root development. In the Auckland Province successful results have been achieved in striking the cuttings outdoors.

Layers

Feijoas propagate readily by layering. The layers are best made in autumn, small branches of the parent tree being taken near the ground and lowered into scooped-out depressions in the soil. The depression should be about 3 or 4in. deep and the layer pegged down, after which the soil should be drawn over the layer for a length of about 6in. The branches used for layering should be of sufficient length because the wood is very brittle and if a branch is too short it will invariably snap off when pressure is exerted when lowering it into the soil depression. Risk of breaking may be minimised by cutting a slight shaving about 2in. long from the branch where roots are desired, instead of making a partially transverse cut as is normally done when layering most other plants.

Provided the soil is moist, roots develop on the layers in spring and the layers may be severed from the parent tree during the following autumn. The plants should then be grown on in a nursery bed for another year before being planted in their permanent positions.

Grafting

Few feijoas have been propagated in New Zealand by grafting, but recently some nurserymen have raised a satisfactory type of tree by that method. The stocks used for grafting are feijoa seedlings. To raise stocks well-grown, fully-ripe fruit should be selected and the seed extracted by squeezing the pulp out of the fruit into a container and covering it with water. The pulp should then be allowed to ferment for about 4 days, after which the seed should be washed in a fine sieve and dried.

The seed is small and may be sown thinly in a seedling tray under glass about the end of May. A light, sandy, sterilised loam is the most suitable soil for seeding, and when sown the seed requires only a light covering of finely sieved soil. To ensure good germination the surface soil of the seedling tray should not be allowed to dry out. As soon as the young plants have grown their second leaves they should be pricked out, and when of sufficient size they may be lined out in nursery rows.

For ease of handling the seedlings should be at least the diameter of a lead pencil when grafted. Usually a stock is 2 years old before it is in a suitable condition for working. Grafting is done in August-September when the shoot growth has become rigid and before spring growth begins. The grafting scions are taken from any piece of mature wood which will give 5 to 6 buds and all leaves are removed. The whip or tongue method of grafting gives the most satisfactory results. Full information about grafting is given in Department of Agriculture Bulletin No. 285, "Grafting of Fruit Trees", which is obtainable free from the nearest office of the department. When the graft has been fitted the scion is bound in position with raffia, but no grafting wax or other sealing material is applied to the union. The grafted seedlings are then placed in a cold frame and planted so that only two buds at the top of each scion are above ground. They are left in the cold frame until autumn, usually March, when growth has matured, and then planted out in nursery rows until big enough to be set out in their permanent positions.

Feijoas may be transplanted without difficulty if the plants are wrenched about a month before being lifted.

Soil Preparation and Planting

Before the trees are planted the soil should be well worked so that root development may progress without check. As the feijoa has a mass of shallow fibrous roots, thorough initial cultivation is necessary, because after the trees are planted deep cultivation near them must be avoided or valuable fibrous feeding roots may be destroyed.

Plants are best set out during June or July to allow them time to become

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established and better able to withstand dry periods during the following summer.

To give the trees a good start a mixture of equal parts of superphosphate and blood and bone at the rate of 1lb. a tree should be applied to the soil in the planting positions and well mixed with the soil some 3 or 4 weeks before the trees are planted. Before each tree is planted the rooting system should be examined and any rootlets which are damaged or misshapen should be pruned off. In planting it is important to tread the soil firmly around the roots so that the young trees have a firm anchorage.

Planting Distances

Planting distances between trees will vary according to whether they are planted in a block or in hedge rows.

In block plantings it is advisable to plant the trees on the square system to facilitate orchard management. They should be set out in rows 15ft. apart with 15ft. between trees; at these distances about 190 trees an acre will be required. Although there are few, if any, old plantings of feijoas in New Zealand, it appears from present indications that if trees are planted in blocks at distances less than 15ft. apart each way, overcrowding will result eventually. When grown as a hedge bordering a driveway or along an orchard boundary for ornamental or low-shelter purposes the trees may be planted from 4ft. 6in. to 8ft. apart, according to individual requirements.

Pruning

For the first 2 years after being planted the trees should be encouraged to produce vigorous growth and at the same time a strong framework should be built up. In block plantings, where fruit production is the main consideration, shaping of the trees is important. In a well-shaped tree the fork (where the main limbs branch) should be at least 12in. above the ground; all shoots which develop below the fork should be removed periodically.

Young tree pruned to develop a shapely, balanced head.

[*Rendell's Photo Service photo.*

Prolific growth made by 6-year-old trees growing on land which has a pH of 6.2.

When feijoas are planted as a hedge the pruning of the young tree to encourage the development of a single trunk before the tree is allowed to branch is not always essential. It is, however, considered advisable to develop a single trunk, for trees so shaped grow into sturdy specimens and cultivation and harvesting operations are greatly facilitated. When the foundation of the young tree is being built 5 to 7 main branches that will develop into a shapely, balanced head should be chosen for the main arms. If necessary, these may be shortened back in the early stages to induce lateral growth and preserve the symmetry of the tree. Once the tree has developed a shapely, balanced head, very little subsequent pruning is necessary or desirable; all that may be required is a possible thinning out or shortening back of straggling lateral growth. Excessive thinning of lateral growth should be avoided, for the wood is very brittle, and if pruning is overdone, severe breakages are likely to occur even if trees are exposed to moderate winds.

Manuring

Some growers believe that little if any manure is required to produce fruit; some believe its moderate to heavy use stimulates growth at the expense of fruit production. That may occur if heavy applications of inorganic nitrogenous fertilisers are used regularly, but more probably failure to set fruit is due to propagation of the plants from seed and to lack of pollination. The causes of failure to set fruit may be minimised by raising trees vegetatively and planting different varieties together.

Many different mixtures of fertilisers are used by growers of feijoas, but on most soils regular applications of a mixture containing blood and bone and sulphate of potash have produced satisfactory growth and crop yields. The quantity of manure applied each year varies with the soil type, the age of the trees, and quantity of fruit they produce. As a guide about 1lb. of a mixture containing 5 parts of blood and bone and 1 part of sulphate of potash by weight should be applied for each year of the tree's age from the time of planting up to a maximum dressing of 10 to 15lb. per tree for mature trees.

The manure should be applied in two dressings. The first, containing the sulphate of potash and about half the blood and bone, should be broadcast around the trees in August. The remainder of the blood and bone should be applied at the end of December or early in January and lightly hoed into the soil.

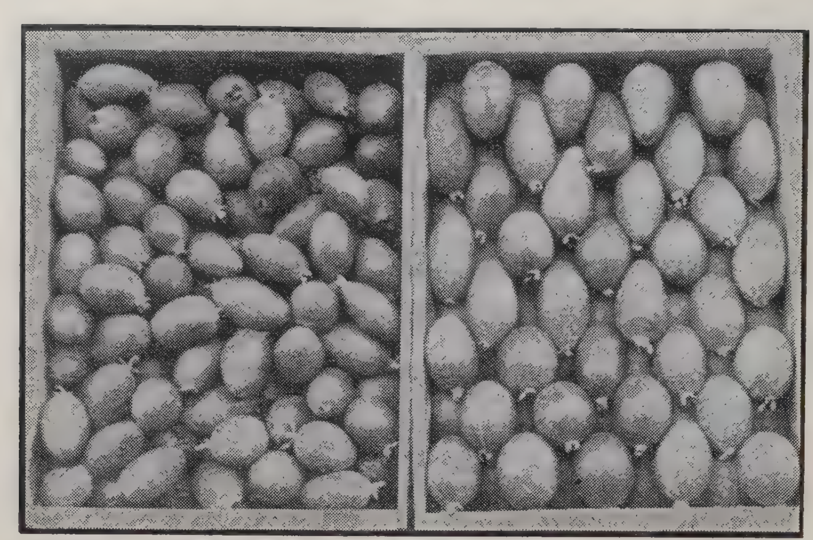
Lime Requirements

It has been stated frequently that the feijoa prefers an acid soil and that it will not tolerate applications of lime. From the general growth of feijoas in New Zealand there is little evidence to support this claim, as plants grow and fruit well on land that has a fairly high pH value. (The pH value of a soil is determined by its acid or alkaline content; pH 7 represents a neutral soil.)

On heavy soils applications of lime improve the soil texture and its use on such soils is beneficial for growing feijoas. On light soils lime applications seem of little importance to the plants. The excellent growth made by 6-year-old trees growing on land which has a pH of 6.2 can be seen from the photograph above.

General Maintenance

Feijoa trees have a mass of fibrous feeding roots near the soil surface and may be damaged easily by careless use of implements. Maintenance cultivation close to the trees should be only deep enough to control weed growth and conserve soil moisture during spring and summer. Where clean cultivation is practised the growing of cover crops will enrich the organic content of the soil. Blue lupins or oats provide good humus and during summer or early autumn



[*Rendell's Photo Service photo.*

Jumble-packed feijoas (left) lack the attractive appearance of a well-packed case (right).

should be sown with superphosphate at the rate of 2 to 3cwt. per acre. The crop should be turned in during winter, preferably with a rotary cultivator.

On light soils in some of the subtropical fruit-growing districts where some orchards are maintained in permanent pasture or green crop, the sward should be mown regularly in spring and summer to reduce moisture transpiration. The mowings, which form a valuable mulch, should be collected and placed on the cultivated squares beneath the trees.

Pests and Diseases

At present in New Zealand the feijoa is attacked by few insect pests and diseases and control measures are a minor item in the production of the crop.

Leaf-roller Caterpillar

The grub of the leaf-roller caterpillar (*Tortrix* spp.) is active during late December and early in the new year, when it may be found attacking the foliage and young shoots of the trees. It eats holes in leaves and frequently chews out the tender growing tips of laterals, but it seldom damages the fruit.

The caterpillars of a bag worm moth may also cause leaf injury by eating small irregular-shaped holes in the leaves. These caterpillars carry a conical "house" around with them and are conspicuous on the foliage during late spring.

Control of the caterpillars may be obtained by spraying the trees with arsenate of lead at 1½lb. to 100 gallons of water. Applications should begin about mid-December and be continued at 3-weekly intervals until February.

Hard Wax Scale

Hard wax scale (*Ceroplastes sinensis*) is common on feijoa foliage and attacks a wide range of plants. The adult scales are cone shaped and greyish white and are capable of producing large numbers of eggs.

The small, star-shaped young scales are usually found on the upper surface of the leaves and are most noticeable during April and May. Sooty mould is associated with this scale and infection of both sooty mould and scales may become severe if control measures are neglected.

Control should be directed against the young star-like stages by applying a 1½ per cent. summer oil spray to the trees during May.

Leaf-spotting Fungus

A leaf-spotting fungus, *Sphaceloma* sp., is occasionally found attacking the foliage of feijoas. This fungus belongs to the same group as that causing verrucosis on lemons. Should the disease appear to an extent requiring control measures, Bordeaux mixture 3 : 4 : 50 should be applied at first signs of spotting. Several sprays at 2- to 3-weekly intervals may be necessary to secure full control.

Harvesting

The first fruits usually mature toward the end of April and harvesting continues during May; in some seasons, usually after a long dry spell, fruit ripens earlier, about the second week in April. The fruits fall to the ground when mature and are not picked from the trees as most other fruits are harvested. They should be collected daily and not left exposed to the sun any longer than necessary, as scalding of the fruit may occur.

Little if any bruising occurs to the fruit when it falls, but to minimise any risk of damage it is advisable to maintain either a loose surface soil mulch or straw mulch under the trees.

When the fruit falls it is very firm and the flesh lacks flavour. It is unsuitable for use until the colour changes to a yellowish-green, when it produces a pleasant aroma and becomes slightly soft. Until feijoas reach that stage of maturity they are unfit to use either for culinary or dessert purposes.

Fruit not required for immediate use should be stored in a cool, draught-proof shed to prevent withering and be marketed before it becomes soft. Under suitable storage conditions fruit may be held for about a month. Commercial growers should guard against holding feijoas too long; when packed for market sufficient life should be in the fruit to allow it to reach the consumer before there is any chance of its deteriorating.

Packing

No standard package for feijoas has been adopted, but the No. 8 flat tomato case in the schedule of standard packages in the New Zealand Grown Fruit Regulations, 1940, has proved a satisfactory container. This case, which has inside measurements of 4½in. x 12in. x 16in. and holds about 20lb. of fruit, is recommended. If necessary this case may be cut in halves, giving an inside measurement of 4½in. x 6in. x 16in.; approximately 10lb. of fruit may be packed in half cases.

The fruit should be of the same maturity when graded to size and should be packed on the diagonal-pocket system, which places the fruits in any layer in the spaces between the fruit in the layer beneath. Packed on this system the fruit presents an attractive appearance when the case is opened and bruising or damage to the contents during transit is reduced.

The use of mauve lining paper contrasts with the greenish colour of the feijoas, enhances the appearance of the package, and frequently adds to the market value. For sending feijoas to distant markets the use of corrugated top and bottom pads will give the fruit added protection against damage.

Neat branding of the railing or shipping mark on both ends of the case simplifies any sorting necessary during transit and frequently avoids unnecessary handling of the fruit. To prevent possible misdirection, care should be taken to use correct abbreviations for railway stations to which consignments are dispatched; the Railways Department will provide information about recognised abbreviations.

The name of the fruit and some indication of the size, such as "large", "medium", or "small", should be stamped or stencilled on one end of the package.

Provided soil and climate are suitable, feijoas grow without special attention and production costs are the lowest of any subtropical fruits produced in New Zealand. If care is taken in the selection of trees for planting, there appears to be no reason why they should not yield a payable return to the grower.

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Dehorning of Cattle

By D. W. CALDWELL, Veterinarian, Department of Agriculture, Hamilton

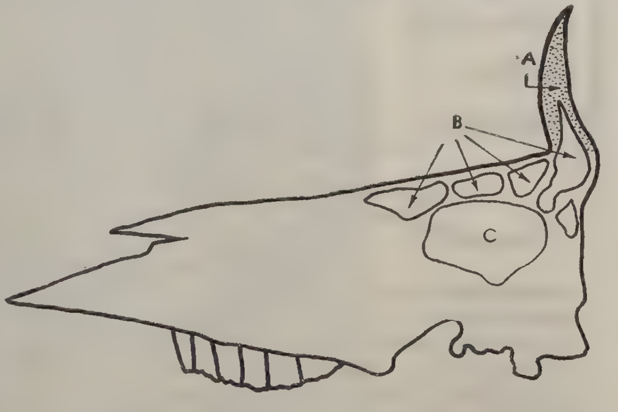
HORNS add nothing to the value of cattle for the purposes for which they are kept on New Zealand farms; on the other hand, they cause damage and indirectly are responsible for loss of production in milking herds. This article discusses various methods of dehorning and also suggests that long-term breeding programmes could give polled breeds for all purposes.

CATTLE are one of the oldest species of domesticated animals used by mankind. Records of domesticated cattle for work and production of meat, hides, and milk go back to the earliest written history. It seems strange that any breed of cattle for whatever purpose they are kept, except as draught animals where horns can be useful, should have retained their horns—weapons of defence and offence and quite useless to domesticated animals; worse than useless, because they can be the cause of great economic loss and danger to other cattle and to their attendants. It is even more amazing that where dehorning is practised, the male is often deliberately left horned and a potential danger to his owner or any other person coming in contact with him. Bulls are notoriously unreliable and tragedies due to goring are common in the cattle-raising areas of the world.

Retained to Enhance Appearance

Many owners of commercial herds dehorn their cattle as a routine practice, but stud breeders usually favour the retention of horns and one seldom sees a dehorned animal in the show ring. Breeders claim that an excellent specimen of a breed type has its appearance enhanced by correctly shaped horns, but it is reasonable to suppose that this fashion could be altered and that in a short time the polled or dehorned animal would be equally attractive and a horned beast would become something of a freak. Cattle are reared and kept to produce meat or milk and neither of these points has anything to do with horns. Ayrshire cattle, to take a good example, are renowned for their ability to produce milk, but it is because of the capacity and excellence of their udders combined with a high efficiency in converting pasture to milk, certainly not because of their formidable horns.

Every year a heavy loss is caused by horn injuries inflicted among cattle and there is a less spectacular but equally heavy loss of production due to bullying and disturbances in herds at pasture, at water troughs, and in yards waiting to be milked. Disturbance is often more serious when cattle are break grazed with an electric fence and a herd eats forward concentrated on a long, narrow strip of grass. Bullying cows without horns will cause trouble, but there is no risk of their causing serious injury to other cattle. A dehorned herd is quieter in the yard, is quickly bailed up and milked, and is handled with less risk of personal injury. Polled or dehorned cattle travel well, do not injure each other in trucks, are easier to handle, and arrive at saleyards or slaughterhouses in better condition without wounds or bruises inflicted by horns.



Cross-section of skull of ox. A—Horn core. B—Frontal sinuses. C—Brain cavity.

The standards of the stud breeder and the show ring should be on a business footing. If dehorned or polled cattle are economically a sounder proposition than horned cattle, a change should be just as desirable in the show ring as in the milking shed or drafting pen. It has been said that dehorning is painful for adult animals, but any pain inflicted is fleeting and less distressing than the often prolonged and repeated pain caused by ripping and gouging from horns.

Change in Temperament

The removal of horns from a group of animals brings about marked changes in temperament. What may be called the "social order" is completely altered; pugnacious cattle which ruled others by their ability to wound or frighten find when they no longer have horns that a more peaceful attitude is necessary and often they become markedly docile. A dehorned herd, like a flock of sheep, will graze steadily with hardly a head lifted from the ground, and when replete will lie down and ruminate contentedly. Such behaviour assists considerably to improve the production of a herd. A vicious bull will often become amazingly amenable after he has been dehorned.

It would surely be better to breed cattle without horns than to submit them to mutilation after birth. Though New Zealand farmers are noted for their progressive outlook, many herds still contain horned cattle, which are potentially dangerous and are responsible for loss in income.

Dehorning guillotine in position.

There are two ways of producing a polled strain of a horned breed. The first is by breeding from the polled mutations which appear from time to time in animals of a pure horned breed, an example of this being the modern strain of polled Herefords bred in the U.S.A., where new registrations of purebred polled Herefords are now over 30,000 per year. The other method is by crossing horned cattle with a polled breed, when all the progeny of this first cross will be polled and the general appearance and commercial qualities will be intermediate between the two breeds. If polled progeny are mated back to the horned breed for several generations 50 per cent. at the fifth cross will be born polled and will be nearly 100 per cent. true in conformation and production to the original horned breed. When polled animals have the desirable characteristics they can then be mated together, and then if breeding is based on the Mendelian laws of inheritance and only animals which breed true to the polled characteristics are selected, a purebred polled strain with all the desirable qualities of the original horned breed can be built up.

Dehorning

An understanding of the composition of the parts involved is necessary to appreciate what dehorning entails. The horn itself is a hollow core of keratin, a material similar to hair, covering and growing from a core of bone which is rough on the surface, is covered with horn-producing cells, and has a plentiful blood supply running through it. The horn core is hollow and communicates with the frontal sinuses of the skull (see diagram at left). The nervous supply to the horn emerges from the skull through a hole above the eye, runs along just below a ridge of bone under the skin, and divides at the base of the horn. The arterial blood supply comes up from the region of the throat.

To do dehorning satisfactorily and to prevent the regrowth of deformed and unsightly horn stubs it is necessary to remove all horn-producing tissue, which means in practice that a ring of hair-bearing skin about ¼in. thick has

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to be removed with the horn itself when dehorning is carried out. In animals at birth and until they are 3 months old the horn is only a bud with a solid core and does not communicate with the frontal sinuses. The ideal time to remove the horn-producing tissue is when animals are from 7 to 10 days old; little pain is inflicted, there is no infection of sinuses and pus formation, and no ugly high poll is left as in dehorned adults.

Young Animals

The methods used for animals a few days old are:—

1. The cautery or hot iron, which may be electrically heated or heated in a fire.
2. Chemicals, usually caustics.
3. Mechanical methods such as a gouge or curved knife.

The cautery or debudding iron is ideal. It consists of an electrically heated copper instrument of the shape shown in the diagram on this page or a fire-heated iron of the same shape. The iron should be heated to a cherry red and applied over the horn bud and moved back and forth until a copper-coloured ring of tissue shows right round the horn bud. This destroys the circulation to the developing horn and the bud eventually drops off. There is no wound, no infection, a poll of pleasing appearance, and, most essential, no horn growth.

Chemicals: Caustic soda or caustic potash are chemicals commonly used for destroying horn buds. A ring of petroleum jelly is smeared on the hair round the horn bud and the caustic stick applied to the bud until it bleeds slightly. Calves must be protected from rain for some days, as rain will carry the caustic down the cheeks or into the eyes, causing irritation and sometimes blindness.

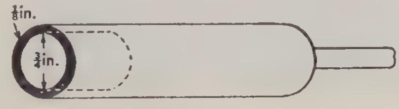
Another chemical used is a flexible paint made of antimony trichloride (28 per cent.), salicylic acid (7 per cent.), and flexible collodion (65 per cent.). The hair round the bud is clipped, the horn bud cleaned with methylated spirit, and the paint brushed on and allowed to harden. If the paint is used on an animal more than a week old, the tip of the horn bud should be cut off before the paint is applied.

Mechanical methods are seldom employed in New Zealand. They involve the use of a curved knife or a double, cup-shaped pincer arrangement for removing the horn bud complete with a ring of hair. This method is painful and often unsatisfactory and leaves a wound which may become infected.

Adult Cattle

Dehorning in adult cattle can be carried out with a guillotine designed for the purpose, a saw, a flexible wire with handles, or rubber rings.

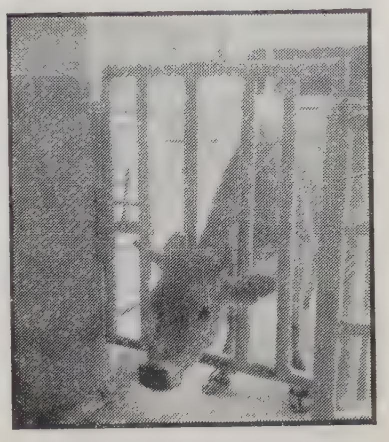
Of the various methods the properly designed guillotine, which is massive and strong and has a ratchet or multiple joint designed to aid the operator, is best if a large number of adult cattle require to be dehorned simultaneously. The horn can be removed cleanly and quickly, but great care must be taken to prevent injury to the bones of the skull adjoining the base of the horn through applying weight and leverage on the heavy guillotine and through the struggling of the animal. Use of a local anaesthetic greatly lessens the pain of the operation and therefore reduces risk of injury through resistance of the animal. Sawing is done with a butcher's saw with coarse teeth, such as is used for cutting bone, but is slower and the animal may become unruly if not properly anaesthetised. An electric rotary saw has been designed for dehorning and has been used to some extent. It is quicker than the hand saw, but slower than the guillotine. The flexible wire method was used principally to avoid bleeding, but requires practice and is too slow. Rubber rings are unsatisfactory for dehorning, though some farmers claim excellent removals. They may slip upward and press on the horn itself with little or no effect. Their action is slow and must cause some continued pain to the animal. Such prolonged discomfort will lower milk yield for some time following the application of the rings. Variation in the diameter of the horns to be removed results in variable pressures from the rings and results are therefore uncertain.



Head of debudding iron.

Whatever method is used it is essential that the horn and a ring of hair be removed quickly and cleanly, that bleeding be prevented as much as possible, and that adequate restraint is available. A local or general anaesthetic prevents pain and reduces greatly risk of interference with production. Blood is often sprayed over a wide area when horns are removed, but bleeding is seldom dangerous and usually stops spontaneously. It can be prevented best by applying a tourniquet of strong string such as binder twine round the poll and both horns with two connecting strings to tighten up from front to rear over the poll between the horns. The tourniquet must be cut and removed after a few hours. Tourniquets are commonly used for dairy cattle, but not for run stock, which are more difficult to yard and bail up in a race or dehorning pen. With run cattle applications of a thin layer of cottonwool carrying a dusting of sulphanilamide powder should be made to the area from which horns are removed. This will clot the bleeding vessels in a short time and only in exceptional circumstances should further attention be necessary. Alternatively an animal could be restrained in a bail, a tourniquet applied as for dairy cattle, and the beast kept in the yards for an hour or two and released after removal of the cord.

String tourniquet round poll of cow.

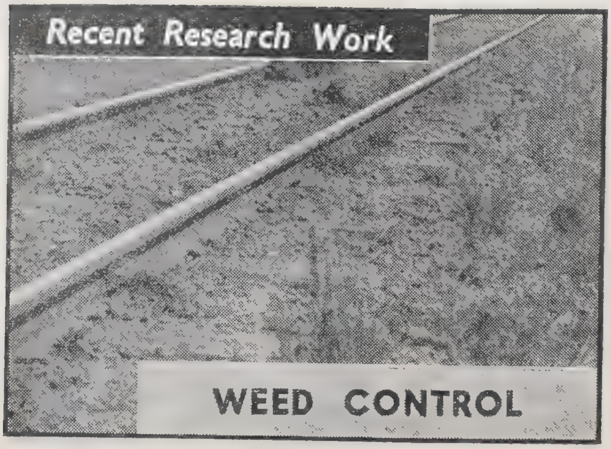


Dehorning bail.

Dehorning bails, either temporary or permanent, are best for restraining animals. They are designed for handling animals about the head while they are held firmly. Every farm carrying cattle should be equipped with a dehorning bail, which is useful for a number of operations other than dehorning.

General or local anaesthesia is used commonly by veterinary surgeons when dehorning adult animals. In Great Britain it is illegal to dehorn cattle over 1 month old without administering an anaesthetic. Local anaesthesia by blocking the appropriate nerve with a suitable injection is very effective and is used frequently.

Consideration should be given by all farmers, particularly cattle breeders, to the desirability of breeding polled cattle for all purposes. Meantime debudding of calves in the first 14 days of their life is the best method of dealing with horned cattle. However, where adults must be dehorned use of a guillotine, a local anaesthetic, and a tourniquet is the ideal method.



WEED CONTROL

INVESTIGATIONAL work carried out by research officers and instructors of the Extension Division, Department of Agriculture, has shown that there is an ever-widening field for the use of chemical weedkillers. Farmers who should seek advice from their local Instructor in Agriculture on the control of specific weeds will find in the following notes a useful summary of the scope and efficiency of some materials which have been subjected to careful trial.

WEEDS IN CROPS

SUFFICIENT trial work has now been conducted in New Zealand to show that the more selective sodium salt of M.C.P. should be used for weed control in crops. The less selective sodium salt, amine, and ester preparations of 2, 4-D have reduced yields of spring-sown cereals, potatoes, peas, and linseed crops. Winter- and autumn-sown cereals are more resistant and may be treated with the less selective materials when over 6in. high. Wherever possible the weeds should be treated at their most susceptible stage of growth and the crops at the most resistant stage. Annuals and perennials that develop from seedlings should be treated as near to the seedling stage as possible, but perennials arising from root suckers should be sprayed as near to the flower-head formation as the crop will allow.

GRASSY WEEDS

T.C.A. (mainly the sodium salt of trichloroacetic acid) has shown great promise for the control of grassy weeds that are little affected by the hormone weedkillers. T.C.A. is particularly valuable for the control of annual grasses such as *Poa annua* and rhizomatous grasses such as couch and various twitches. Stoloniferous and fibrous-rooted grasses in general are more tolerant and require heavier dressings for control. The most efficient way of using T.C.A., which is mainly absorbed into the plant through the roots, is to plough and spray the upturned sod. Alternative methods are to spray, then cultivate 3 to 4 weeks later, or to mow or graze heavily and then apply the T.C.A. T.C.A. requires moist soil for activation and should if possible be applied shortly before rain falls. Application in autumn usually gives the best results. The rates should be varied from 20 to 100lb. per acre according to the type of grass and the method of application employed.

—*L. J. MATTHEWS*

* * * *

WEEDS ON RAILWAYS

PRE-WAR investigations with sodium chlorate and ever-rising labour problems led to the introduction by the New Zealand Railways Department of track-spraying operations by a weed spray train outfit. Applications of a sodium chlorate-based material, "Atlacide", at a rate of approximately 200lb. in 200 gallons of water per mile are normally applied in October-November, and again in April, more or less coincidental with growth-rate peaks. In this way satisfactory weed control has been maintained, although deep-rooted perennials and well-established grasses show resistance and necessitate some hand weeding.

SODIUM CHLORATE

EXPERIMENTAL work was begun in 1946 to determine the maximum efficiency of sodium chlorate. These early studies indicated that two applications annually gave better results than a single application at double the standard rate, that spring applications were more efficient than autumn applications, particularly in controlling freely seeding annual weeds, and that high-volume applications are 10 per cent. more efficient than low-volume applications. It was demonstrated also that deeply rooted biennial and perennial weeds and grasses such as sorrel, white clover, tall fescue, and paspalum were partially resistant to sodium chlorate-based materials. It was also shown that considerable advantages may be expected from the use of small, slow-speed, low-volume spray units located at suitable stations instead of one heavy high-volume unit to cover the whole system. By this means the weeds could be sprayed at the most susceptible stage.

NEW TYPES OF WEEDKILLERS

WITH the advent of new types of weedkillers further trials were initiated using sodium chlorate-based materials, applied at the rate of 120lb. per acre, as a standard for comparison. These trials showed that fuel-oil mixtures containing hormones of 2, 4-D and 2,4,5-T acid base and chlorinated phenols applied by low-volume methods are significantly inferior at the rates specified by manufacturers, but their efficiency may be increased to that of sodium chlorate-based materials by doubling the rate of application. Costs would then be twice that of the sodium chlorate treatments. The efficiency of trichloroacetate applications approximates that of sodium chlorate, but superior kills of adult grasses follow the use of increased dosages. The addition of borax to sodium chlorate did not increase the toxicity of this material. These trials have shown that should supplies of sodium chlorate-based materials fail, alternative materials are now available with efficiencies equal to that of the standard material, but at some increase in costs on present figures.

—*R. K. WARD*

* * * *

GORSE CONTROL

IN the Warkworth district field experiments have been carried out to determine the efficiency of hormone weedkillers for the control of gorse. Both 2, 4-D and 2,4,5-T ester preparations were used. The esters of 2, 4-D had no effect on the gorse and are considered valueless for gorse control. Seedlings past the seed-leaf stage and bushy gorse up to 3ft. high have been effectively controlled with 2,4,5-T oil-based esters.

If good results are to be obtained, it is important that the plants be completely covered with the spray. Volatile esters of 2,4,5-T are a distinct aid in securing complete over-all foliage cover. Small gorse is more easily covered and will require less spray than larger plants. It is therefore recommended that tall gorse, over 4ft., be dealt with as follows:—

(a) Cut, crushed, or burnt and the regrowth sprayed.

(b) Cut and a mixture of 2,4,5-T ester and dieselene applied to the cut-stump surface. One pound acid equivalent should be diluted with 20 gallons of dieselene and applied soon after cutting.

Because of the necessity for a complete spray cover, it is almost impossible to obtain a 100 per cent. kill with one application. The experiments have shown the need for two sprayings if complete eradication is to be effected. The first spraying will account for 90 to 95 per cent. of the gorse and this should be followed by spot treatment to those plants showing some green foliage.

The amount of spray required will depend on the density and size of the gorse. For areas thickly populated with young gorse as is often found in new pastures 1lb. acid equivalent of 2,4,5-T oil-based ester will be required for each acre. To control bushy gorse the amount should be increased to 2lb. acid equivalent of 2,4,5-T oil-based ester per acre. Throughout the experiments water has been used as a diluent with complete success. There is nothing to be gained by using oils and in fact their use may impair the action of the weedicide.

Hormone weedkillers are most effective during warm weather and when plants are growing vigorously. Spraying at any time from October to February inclusive will give good results for seedling gorse past the true seed-leaf stage. Regrowth gorse, where translocation of the chemical through the plant is essential for root control, should be treated from December to February.

Older gorse falls into the same category. The older plants must have full and mature leaf development before the hormone is translocated into the roots. Young, immature leaves are not able to translocate hormones.

—*C. M. BLICK*

Commercial Vegetable Growing in the Pukekohe District

By T. C. R. DAWE, Vegetable Instructor,
Department of Agriculture, Pukekohe

CULTURAL practices on an 80-acre commercial vegetable garden in the Pukekohe district, 32 miles south of Auckland, on the main North Island railway line, are described in this article. The gardening area, which is dominated by the well-known feature Pukekohe Hill, is almost frost free and admirably suited for the production of early vegetables.

THE district is specially noted for early potatoes, which are grown mainly on the "Hill", and for long-keeping onions. Most of the staple vegetables are produced in large quantities. Other miscellaneous vegetables such as radish, silver beet, turnips, red beet, lettuce, and celery are not grown in appreciable quantities. They are supplied by gardens closer to the principal markets.

Since 1911, when the main trunk railway from Wellington to Auckland was completed, vegetable growing at Pukekohe has increased steadily, until now approximately 2000 acres are producing vegetables each year. Originally, potatoes and onions were the main crops, but the rapidly increasing population of Auckland City and improved rail and road transport facilities have led to Pukekohe district becoming the centre of a more general gardening industry.

The land used for vegetable growing is more or less undulating, with adequate natural drainage. The soil of the "Hill" is a red-brown volcanic loam, and that of the surrounding country a medium to heavy clay loam. These soils respond well to applications of fertilisers.

The climate is mild, with a well-distributed rainfall of about 50in. per annum. Temperatures do not fluctuate to a great extent and relative humidity is usually in the vicinity of 70 to 75 per cent. These conditions are equally favourable for plant diseases and for vegetable growing, and consequently producers are obliged to maintain a vigorous programme for disease control. Modern methods and equipment enable growers to deal successfully with most of the problems, but they must be continually on the alert and ready to meet the unexpected as well as the normal attacks of diseases and pests.

The areas of individual gardens range from 5 to 100 acres. Most of the land produces two crops; from the more favourably situated parts it is possible to take three crops annually.

Crop rotation is practised, but green crops are seldom grown, although some humus is provided by ploughing under weed growth, crop residues, and trash from harvested crops.

Mechanical units of various types, according to the size of individual gardens, are employed to do most of the cultivation. Horses are still used to a limited extent, mainly on the smaller areas, but also for urgent work on larger gardens when unfavourable weather prevents the use of mechanical power.

Bagging early potatoes in the Pukekohe district.

The programmes and practices described are those used in an 80-acre garden on the north-west side of the "Hill", including areas on both of the soil types previously mentioned. While it is inevitable that methods used in other gardens should differ to some extent in detail, those described have been found successful and may be considered fairly representative of sound practice in the district.

Potatoes

Potatoes are still one of the major crops. Planting begins in June, and with successional plantings, early and mid-season potatoes are supplied from September to January. This out-of-season potato production calls for heavy fertilising and rigorous disease control. Weather conditions, particularly during the spring and early summer, are very humid and attacks of blight are frequent. Control measures consist of spraying at intervals of from 7 to 10 days with copper compounds.

Varieties grown are Arran Chief and Gamekeeper, planted in rows 2ft. 3in. apart with 9 to 12in. between sets. Harvesting begins at 3½ to 4 months from planting, when the tubers are large enough to ensure a profitable return but before they are fully mature. Cultural and disease control operations begin when the plants are about 3in. high. In some instances surface cultivation is carried out as the plants are just emerging, by the use of saddle-back harrows, which leave the soil in a good tilth and suppress weeds. Hand hoeing, scarifying, and moulding are continued until the haulms become too large for convenient working, when a final high moulding is given.

Bordeaux and Burgundy mixtures and copper oxychloride are used for blight control. In recent years the last-named has been most favoured. During very wet seasons better control of blight is obtained by alternate applications of Bordeaux and copper oxychloride sprays. During January, February, and March preventive sprays are applied for the control of potato tuber moth, and 1lb. of D.D.T. wettable powder (50 per cent.) to 100 gallons of water has given satisfactory control. D.D.T. may be mixed with the copper sprays.

Fertiliser Mixture

Good results have been obtained by the application of the following fertiliser mixture applied at the rate of 20 to 25cwt. per acre: Superphosphate, 4cwt.; dried blood, 4cwt.; potash, 2cwt.; blood and bone, 6cwt.; bonedust, 2cwt.; and sulphate of ammonia, 2cwt.

Seed potatoes are selected from the November-harvested crop and are replanted within a month to be lifted in the following March and April. Yields of from 5 to 7 tons are usual from crops sown for seed.

The early and midsummer per acre crop yields vary with the time of digging. They are usually: September, 4 tons; October, 5 tons; November, 7 tons; and December and January, 8 tons. Heavier yields have been recorded when the weather has been very favourable during the growing season.

Onions

Onions are grown in large quantities both as transplant and as seedling crops. Transplant crops, the plants for which are grown in a seed-bed sown

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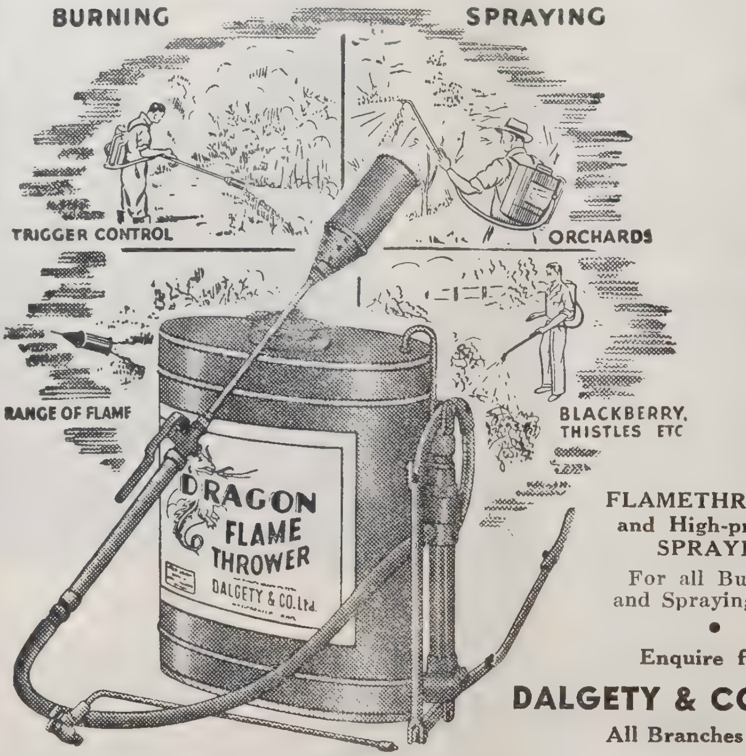
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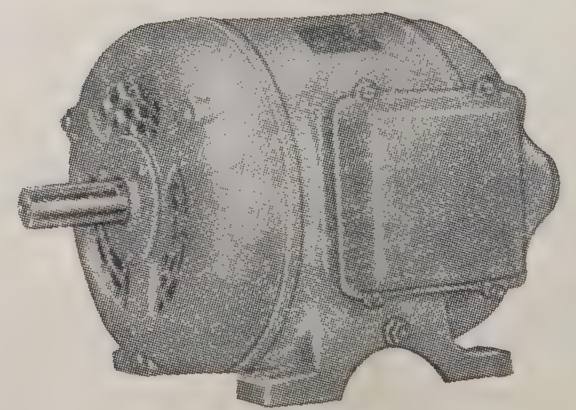

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Crop of onions cured and ready for bagging.

in February, are planted out in the field during May and June for harvest during the following January and February. In seasons when a shortage of household onions occurs some of these are harvested early as green onions. Usually transplants are sold directly off the field, as they are of doubtful keeping quality. Yields of 12 tons per acre are usual.

Seedling crops are sown directly into the field by single or multiple seeding units at the rate of 4 to 5lb. of seed per acre. Rarely is it necessary to thin this crop. Onions are harvested in March or April, graded, and the best types stored for winter and spring sales. The seedling crop produces bulbs of excellent keeping quality. Yields are generally slightly lower than from transplanted crops.

Varieties grown are Pukekohe Early Straw for early harvest and Pukekohe Long Keeper for transplant and seedling crops. Wheel hoeing is commenced as soon as the plants have emerged and continued at intervals until bulb growth prohibits this operation. The most costly item in onion production is hand weeding of the small plants. Successful weed control among the young plants has been obtained recently by spraying the rows of seedlings with a 10 per cent. solution of commercial sulphuric acid.

When the crop has fully matured the onions are lifted and allowed to lie in the field to cure, being turned at intervals by hand raking. Topping of onions is at times carried out in the field by manual labour or by mechanical onion toppers, but on some occasions the bulbs are stored untopped until they are finally sorted for marketing.

A ton of lime per acre is applied at least a month before seeding or planting out. The area used for onion growing is then fertilised with a mixture of 1 ton of bonedust, 1cwt. of sulphate of ammonia, and 1cwt. of potash per acre.

Onion downy mildew and onion thrips usually affect the onion crops and control measures by fungicides and insecticides are necessary.

Control of onion mildew can be obtained by spraying with Bordeaux mixture 5 : 4 : 50 to which 1 pint of summer oil is added as a spreader. Applications are first made when plants are from 4 to 6in. high and fortnightly sprayings are generally necessary for adequate control.

The control of onion thrips (*Thrips tabaci*) is difficult during warm weather. Some control has been obtained by the application of sprays consisting of nicotine sulphate 1 : 200 and D.D.T. (50 per cent.) 1lb. to 100 gallons of water with the addition of 1 pint of summer oil to every 100 gallons of the mixture. Fortnightly applications are advisable as a normal treatment, but it is sometimes necessary to spray much more often. By spraying before infestation is apparent good control has resulted. The above sprays for onion mildew and thrips can be combined.

Cabbages

Cabbages are grown for harvest throughout the year, September being the most difficult month to produce good yields, because of seed-stem development.

Plants are raised in open seed-beds, where rigid disease control measures are carried out. Downy mildew in seed-beds is prevalent most months of the year, and spraying for caterpillars of the diamond-backed moth and white butterfly is necessary during the warmer periods. Cabbage aphis is extremely difficult to control during January, February, and March.

Spring-harvested types of cabbage are planted in June or July. The favoured varieties Greyhound, Jersey Wakefield, and Charleston Wakefield are harvested during September to December and yield from 6 to 8 tons per acre.

From October to January the variety Golden Acre is planted for harvest during December to April. This quick-maturing cabbage yields up to 14 tons per acre and is harvested from 8 to 10 weeks from planting out.

Cabbages for winter harvest are planted out during March, April, and May, the varieties being Early Market (Hendersons), Green Acre, and Copenhagen Market. These round-headed types yield excellently and successional plantings ensure supplies from May to August inclusive.

The planting programme mentioned above enables the grower, by selecting

Crop of Early Market cabbages ready for harvesting. Sparrow Industrial Pictures Ltd. photo.

Good crop of Greenfeast peas grown for canning.

varieties suitable to local climatic and soil conditions, to supply cabbage the year round.

Cabbage crops are fertilised with a mixture usually comprising 10cwt. of blood and bone, 2cwt. of bonedust, 3cwt. of superphosphate, 2cwt. of sulphate of ammonia, and 1cwt. of potash, which is applied in bands just before planting out at the rate of 1 ton per acre. Lime is applied also at 1 ton per acre at least a month before planting.

Cultural practices are hand hoeing, scarifying, and light moulding to ensure adequate drainage, particularly for the winter crop. Spraying or dusting with insecticides for the control of diamond-backed moth and white butterfly caterpillars is necessary during summer and autumn.

Cauliflowers

Cauliflower crops receive manurial, cultural, and disease-control treatments similar to those for cabbage crops. To stimulate the development of the curds crops are generally side dressed about a month before curd development with 1cwt. of nitrate of soda mixed with 1cwt. of superphosphate per acre, after which a light moulding is given to draw the fertiliser toward the plants. Cauliflowers for winter supply are planted from February to April and for late-summer and autumn harvest during November and December.

Varieties favoured are Phenomenal Early, Phenomenal (5 months), and Phenomenal Main Crop.

Tomatoes

Tomato production for condiment manufacturers is also a major part of the cropping programme. Plants are purchased from nurserymen and planting out begins during October and is completed by early November. Here again disease control is a serious problem, and the plants are kept sprayed from the time of setting out. Copper oxychloride sprays are favoured for the early applications, with alternate sprayings of Bordeaux mixture and copper oxychloride in the later stages of growth. Up to 10 applications have been necessary in some seasons. D.D.D. 25 at the rate of 1lb. of powder to 100 gallons of water is applied to tomato crops for caterpillar control after fruit has formed. D.D.D. gives adequate control of stem borer caterpillar and may be mixed with copper oxychloride sprays. Harvesting begins in late January and continues until April in most seasons. Yields of from 10 to 14 tons per acre have often been recorded.

Adelaide Dwarf is the main variety grown and is very suitable for this district, being an upright bushy type, which can be easily sprayed and worked. Plants are spaced 2ft. apart in the rows, with 3ft. between rows, which provides 4000 to 5000 plants per acre.

The following base application of fertiliser has produced good yields:—

Superphosphate	5cwt.
Dried blood	5cwt.
Bonedust	5cwt.
Blood and bone ..	3cwt.
Potash	2cwt.

Shallow inter-row cultivation is carried out during the first 3 months of growth or until the plants cannot be cultivated without damage.

Carrots and Parsnips

Carrots are grown the year round. Sowing in rows 12in. apart begins in July for harvesting in November and December as spring carrots. Yields of up to 6 to 8 tons are harvested from these plantings. Successional plantings continue at intervals until the following March. These later plantings can be carried over in the soil until August and September and produce yields of from 12 to 15 tons per acre. Weeding is the main cost in the growing of the carrot crop. Weeding by the use of a suitable grade of power kerosene is practised extensively and is of considerable assistance.

Disease control for green carrot aphis and rust fly is usually necessary during the growing period from October to March.

Little or no fertiliser is applied to main-crop carrots. They are planted on land which has been heavily fertilised for the preceding crop. Topdressings are applied when necessary for spring crops.

Varieties grown are: Early Krop, Manchester Table, and Chantenay.

Small quantities of parsnips are grown, the Hollow Crown variety being favoured. They are sown in June for spring harvest and in November-December for winter supply. The cultural methods applied are similar to those for carrot crops.

Peas and Beans

Peas for canning are grown as a catch crop only. Yields of up to 30cwt. per acre of shelled peas are obtained. They are grown in rows 15in. apart and cultivated similarly to other row crops and are usually planted on land which has been heavily fertilised for the preceding crop, with up to 10cwt. of lime per acre added when necessary. Plantings are made in October and November for harvesting in January and February. Greenfeast is the main variety.

Beans, planted in 15in. rows during late October or early November, are grown mostly for canning. They are generally planted on land that has been heavily fertilised for the previous crop. When necessary an application of 5cwt. of superphosphate per acre is given. Cultural operations consist of weeding, hand hoeing, and scarifying. The principal variety grown is Asgrow Stringless, which is harvested in February in an immature state for the canneries. The yield varies from 30cwt. to 2 tons per acre. Beans are regarded as a short-term catch crop between main plantings of other vegetables.

Pumpkins, Marrows, and Kumaras

Pumpkins are grown mostly for storage for late supply, being planted in October-November. They are favoured with a long growing season in Pukekohe district, as it is not necessary to harvest them until the following April or May, before frosts are likely. They can be stored successfully in sheds until the following August, September, or October, when a good return is generally assured. Pumpkins are usually grown on land heavily fertilised for previous crops. Varieties are Triamble and Crown.

Marrows are grown in small quantities, the bush type being preferred for harvesting in January and February.

Kumaras are not grown to any great extent. They are planted during November for April-May harvest, and the Tauranga Red variety is generally favoured.

Busy Year

It will be realised that a Pukekohe commercial gardener with 80 acres of land producing vegetables has a very busy year. With most of the area producing two crops, and some of it even three in a year, from 10 to 15 male workers are employed. In addition more than 50 casual workers are employed, mainly on a contract basis, for weeding, when necessary, and for harvesting the large quantities of vegetables produced.

Replacements for Town Supply Dairy Herds

By I. G. WATT, Veterinarian, Department of Agriculture, Auckland

THE dairyman on town supply is always faced with the problem of maintaining his "quota"—the quantity of milk he has contracted to supply throughout the year. Replacements to town supply herds as required are essential and in this article some practical methods of keeping an adequate reserve of cattle for such herds are discussed.

NOW that compulsory tuberculin testing has been introduced for these herds it is more important than ever that a supply of healthy cows is available to replace milkers culled from herds on town supply.

With this system of farming there is on the average a larger wastage factor than in creamery herds, and it has long been a matter of great concern among town supply farmers that the cows they have to buy may be someone else's culls. Many mature dairy cows sold in local sales are there because they have been failures in another herd. Temporary sterility, mastitis, black pox, bad temper, and low production are common reasons for a farmer's culling from his own herd, so why should it not be the same for his neighbour? Thus some cows are passed from herd to herd with a loss everywhere the animals are introduced.

Much of this loss is due to the farmers themselves. If they would send the cull cows to the works instead of to the local sales, much of the loss due to unsound cows circulating among the herds would be avoided. This would be hard on farmers who like to fatten a few boners, but it would prevent unsound animals returning to dairy herds.

Buying mature cows from an unknown source leads eventually to trouble in the herd. Many of the cows may be cases of latent tuberculosis, which could develop to infect the whole herd; others may be carriers of trichomoniasis, the cause of "temporary sterility", or may introduce contagious abortion or the less serious vaginitis. They may not be noticed until too late; a mature cow without a full history may be as dangerous a source of infection as a scrub bull picked up at a local sale. Empty cows are particularly dangerous.

The owner of a small herd may be forced to buy cows at the drop, as the area of his farm will not allow him to carry non-producing animals. On some of these farms no dry stock at all are kept. The way to overcome this difficulty would be to buy from dispersal sales, but autumn calvers present a problem. However, those herds are quite few, relatively, and the majority of town suppliers could safeguard the health of their herds by avoiding the mature cows and replacing as necessary either by buying heifers or by rearing their own calves. Buying heifers close to calving naturally has its risks, as their capabilities are unknown; in any case, the yield will be lower than that of cows for a season or two, but heifers are generally much freer from disease than adult cattle, since they have not been exposed to infection so long, and this is an important factor in maintaining the health of the herd.

The obtaining of suitable heifers will be discussed later.

There are, then, two possibilities for the progressive town supply farmer—he can either buy heifers or rear calves.

Calves can be derived from the herd itself or bought very young from suitable breeders. The latter method would appeal before the herd was built up to an efficient level of production, and the calves introduced would, in time, be a most valuable addition to the herd. The advantages of rearing calves are obvious and are being appreciated more and more by town supply dairymen.

The "backing" of both sire and dam can be known—not only the amount of butterfat, but, more important to this branch of the industry, the amount of milk of reasonable test given over a long lactation by a healthy cow which breeds regularly. The temperament of the dam is known and a quiet, amiable, easily milked cow is the ideal town supply animal. In tuberculin-tested herds —and all town supply herds will be tested eventually—there would be no possible chance of introducing tuberculosis. Calves could be vaccinated against contagious abortion also and the risk of "slipping" practically eliminated.

The use of good bulls would be warranted, and the indiscriminate buying of scrub bulls at sales eliminated. These bulls are often the means of spreading genital tract infections from herd to herd. Further, the progeny of the better type of cow in the herd would not be wasted in the bobby calf pen. There must be thousands of calves of excellent possibilities on the dams' side sent to the works each year. Rearing of heifer calves from the best cows in each herd would save this waste and at the same time the whole herd would be graded up so that in a very few years there would emerge a herd of which any owner would be proud. Interest taken in stock bred and reared by himself gives the farmer a sense of achievement. Sharemilking contracts which forbid rearing of young stock are to be strongly condemned.

Methods of Rearing

If the rearing of calves is discussed on economic grounds and the immediate cash outlay and returns balanced, it is extremely difficult to say whether rearing calves pays or does not pay.

Heading photograph by A. N. Breckon.

Costs of rearing have been estimated from £9 per head on a Jersey stud farm to £2 10s. on a grade farm where proven sires have been used for years and where the herd average is in the vicinity of 450lb. of butterfat, with a target of 300lb. before Christmas.

There are, however, many factors, already mentioned, which must be taken into consideration. It would obviously be difficult to assess the loss which might be caused if a "storm" of "slips" due to contagious abortion occurred in a herd or if a bought-in animal infected the remainder with trichomoniasis. A farmer's rearing of his own replacements must be assessed as an insurance policy against introduced disease as well as a method of obtaining milkers for the herd.

There is a choice of several methods of rearing calves for town supply farms; for example, they may be bucket fed at home, reared on nurse cows, or sent to a creamery supplier to rear until weaning. Each method has its adherents and the advantages or otherwise will be discussed. The methods of feeding calves on the farm are set out in Department of Agriculture Bulletin No. 228, so that in this discussion only special points will be raised.

Bucket Feeding

On town supply farms bucket feeding means that after the initial 3 weeks or so on whole milk the breeder has the alternative of continuing with whole milk or of changing on to substitutes such as skimmed milk powder, buttermilk powder, meal, etc. Whole milk is expensive, especially when paid for at town milk winter prices, so that it is essential that the most economical method is used.

The new-born calf to develop normally must receive colostrum or first milk, which is laxative and also contains many protective substances. Subsequently the calf should be fed on whole milk, for calves under 2 weeks old must receive whole milk, whatever they are to receive after that age. For some time there will be a certain amount of milk available which cannot be used for human consumption, as it is illegal to use milk for town supply until the cow has been calved for 4 days, and as the cows calve over a period, no saleable milk need be used in some cases.

The quantity fed should be carefully measured—a quart for the second day, preferably divided over three feeds, and then gradually increased so that after a week the calf will be receiving between 2 and 3 quarts daily. Of course, larger calves will require more food than small Jersey calves.

As cows will be calving over a period, there will be colostrum which is not needed for the new-born calves. It was formerly considered very risky to give colostrum to calves over a week old because of the laxative effect, which might cause scouring. Some recent work overseas, however, has shown that colostrum can be used by itself, if broken down with water—one third of water to two thirds of colostrum—for feeding older calves. This means that any colostrum in excess of what is required for the new calves could be mixed with the calf feeding milk and thus not be wasted. Further, as this substance is rich in vitamin A, the usual calf milk would be fortified by adding quantities of this valuable protective vitamin.

In order to conserve milk the Department of Agriculture Animal Research Station, Ruakura, has investigated methods of early weaning and the general recommendation has been made that 50 to 60 gallons of whole milk are adequate if fed over 8 weeks, the calves then being weaned on to good pasture and rotationally grazed. Undersized calves should, for safety, be given a further 2 weeks' milk feeding. This is still expensive using milk at winter prices, and in an endeavour to ascertain how things were working out in practice the writer visited ordinary commercial town supply herds where breeding replacements was accepted as the usual practice. All these farmers were convinced that rearing calves was economic and in all cases whole milk alone was used up to 2 weeks, this being mainly milk unsuitable for human consumption. After this period a change was made during a further 2 weeks on to a substitute such as skimmed milk powder, dried buttermilk powder, mother liquor (a by-product of the milk sugar industry), straight meal, etc. Dried buttermilk was most popular and reared excellent calves. The quantity generally used was about 1lb. mixed with a gallon of water, the mixture being stirred vigorously. First-quality buttermilk powder is considered essential. The cost of this method of feeding was estimated at about 2s. per calf per day, which is not excessive. Animals reared on dried buttermilk powder on one farm produced up to 358lb. of fat as 2-year-olds for a total cost of whole milk and buttermilk of £2 10s. per calf.

[*Sparrow Industrial Pictures Ltd. photo.*

A good type of Ayrshire bull to sire town supply herd replacements. No branch of the dairy industry can afford to use scrub bulls.

Some farmers prefer calf meal. On one farm visited excellent calves were reared during the expensive milk period by feeding whole milk for the first 2 weeks and then breaking the calves over the next fortnight on to a diet of meal and water. The meal used was a proprietary product and the total cost of meal for six calves was just under £5. This was much less than the cost of raising them on milk at 2s. per gallon.

Meal feeding was continued up to 8 weeks, but the time varied, depending on the quality of the pasture available and on the size of the calves, which when seen were thriving and quite up to others of the same age in size and vigour.

Bucket feeding has its dangers. More calves are killed by over-feeding than under-feeding. Over-feeding from the bucket is the most likely cause of serious scouring among calves. Not only is food being wasted when calves are scouring, but simple scours can cause deaths rapidly if neglected.

Bulletin No. 228 deals with scouring fairly fully, but some additional information may be helpful, especially on some farms where scouring appears to occur each year despite efforts of the farmer to maintain cleanliness. Feeding calves from the bucket may be dangerous because the calf may bolt too large a quantity of milk—often cold. In natural feeding, when the calf takes small quantities of milk as required and well diluted with saliva, the curd formed in the stomach is soft; under conditions on most dairy farms the curd may be formed into a hard mass which is digested by the animal only with great difficulty. Particularly is this so where high-testing milk is used. This opens the way for bacteria, and "white scours" or "blood scours" may occur very easily. Much of the blood scours is due to coccidia and unfortunately a calf paddock may become infected with coccidia and cause trouble each year.

Prevention is better than cure, and milk should be diluted with water and fed warm. This will help to maintain normal conditions, more especially if the calves are not restricted to one paddock, but are moved around from an early age. If scouring occurs, sulpha drugs given under veterinary direction may be very useful; for blood scours a veterinarian will prescribe suitable treatment.

A simple device has been patented by a farmer at Karaka, Auckland, by which calves are fed by suction through a rubber teat. It is rather astonishing that more breeders do not make use of this idea, as a much more natural feeding action is obtained and scouring is therefore less likely to occur.

Nurse Cows

Some very successful town suppliers have used nurse cows to rear calves, up to eight calves having been reared on one cow during one season. Naturally this is hard on the cow, but the method offers the easiest way to rear calves when fresh skimmed milk is not available.

Here again caution must be exercised. Nurse cows should be tuberculin tested before being used for calf feeding. As the cows are run with the calves, away from the main herd, risk of reinfection with tuberculosis during the feeding period is remote, but each season these cows should be tested as a precaution.

Congenital tuberculosis in calves is comparatively rare in New Zealand. This has been investigated by post-mortem examination during meat inspection on many thousands of bobby calves in meatworks. However, tuberculosis may be rapidly acquired if tuberculous animals are used as nurse cows, particularly if the udders are infected. Heifers reared on nurse cows should be trained after weaning to go through the bails, as they are liable to be very difficult animals to break in later if they are not handled early.

Some farmers do not wish to go to the trouble of rearing their own calves. It is possible in many cases for them to make arrangements with a creamery supplier to take a certain number of calves to rear until weaning. Here again there is the chance of the calves becoming infected with tuberculosis through drinking infected milk. This can be a very real risk in certain areas. As the suggestion that the owner should have his whole herd tuberculin tested before rearing the calves might not be very welcome, with the high price of cows at present, the alternative would be to have the calves tuberculin tested before they are brought home after weaning. A general idea of the infective possibilities of the milk could also be gained from the killing sheets of pigs if any are slaughtered on the owner's account, and, in addition, a herd with a history of cows condemned clinically for tuberculosis should be avoided. One farmer who had his calves reared as described stated that the cost was £5 10s. per head, the calves being returned healthy and fit by the new year.

Whatever method of feeding milk is adopted, the most critical time for young animals is after weaning. Rotational grazing in the best of pasture is essential. Calves can be used to top paddocks effectively and even quite young animals will graze steadily over the tops of well-grown pasture without taking much from the cows which follow them.

The sending of cull cows to the works instead of disposing of them at stock sales would prevent the return of many unsound cows to dairy herds.

More especially in the warmer areas, worm parasites must be avoided, particularly *Haemonchus contortus*, the large stomach worm, and regular phenothiazine drenches given, except under the most ideal conditions, when drenching may not be warranted.

Rearing Yearlings

An additional problem confronts the average town supply farmer who stocks up to the limit and does not have grass to spare for young stock. At the same time he wishes to rear his own replacements and add interest to farming. This is where interested bodies should take a hand. It should be possible without undue difficulty to arrange a scheme whereby suitable graziers could take weaned calves for a reasonable fee, rear them on the more extensive properties until they are well in calf, and then return them to the owner. A variation of this scheme would be for certain dairy farmers to contract to supply "marked" heifers to a rearer who could buy them for a satisfactory price and subsequently sell them to town supply farmers.

Some dairy farmers already supply an annual quota of heifers to town suppliers, and this system is capable of wide extension.

Hit-or-miss methods are of little use. Agreements would have to be made and a guarantee given to supply and take a regular number of heifers whichever system is to be used.

In spring, when grazing is plentiful, many people are willing to graze a few heifers to keep down the feed, but such a scheme would be of little use if the heifers had to be taken back in summer or autumn when feed becomes short.

This article envisages a wider development whereby calves would be taken and carried for a definite period so that heifers calving when required could be supplied. For example, in the Auckland town supply area the majority of such heifers would be required to calve in early autumn. Therefore, calves kept would be autumn calves where possible. Since these heifers could be tested for tuberculosis and inoculated against blackleg and contagious abortion, their value as replacements would be great, especially as they would be coming in during autumn.

On a national basis, there is a challenge to the whole dairy industry. Quite apart from replacements to town milk herds, farmers should realise that New Zealand can no longer afford the annual loss of calves from above-average cows to the bobby calf pools. Nor can she afford the continued use of scrub bulls and cull cows in any branch of dairy farming.

Breed societies, particularly those concerned with milk-producing breeds, could profitably interest themselves in this field, as the potential market both for heifers and for herd sires is very great indeed, with no possibility of saturation of the market. The demand for marked calves will increase as breeding becomes general throughout town supply herds and the present wasteful buying and selling methods are abandoned. Marked calves are at least a sign that the breeder is herd testing and thus give some indication that the calves are from dams well up to average production.

On a fully organised basis artificial insemination in town supply areas would enable proven sires in the milk-producing breeds to be used to better advantage.

Winter Overhaul of the Home Garden Can be Done in May

By C. L. NAPIER, Orchard Instructor, Department of Agriculture, Hastings

WINTER CROPS should be well established by May, and as extensive spring plantings will not begin for some weeks, gardeners should be able to take advantage of the relatively slack time to overhaul their equipment. Clean, sharp, and efficient equipment assists considerably in speeding up garden duties and making them less laborious.

BESIDES the checking of tools and other equipment there are many other tasks that can be done during the month. Compost bins can be repaired or constructed, the tool shed tidied up, and other small jobs done that never seem to be completed during the busy summer months.

Good Tools Important

One of the most important items in the home garden is a set of good tools suitable for all major operations. Gardening can be made pleasant if gardeners pay attention to the types of tools purchased and particularly to the condition in which they are kept after purchase.

After use all tools should be cleaned or scrubbed thoroughly and then dried. Coatings of rust or dry, hard soil on implements such as spades, hoes, and forks can make work very tiring. Clean spades, like sharp knives, assist to reduce the physical effort needed in using them. After being cleaned most tools benefit from a light coating of oil or grease. An oily rag kept in a tin containing a little oil and placed beside the tool rack is very useful. Tools can be rubbed over after they have been cleaned and then placed in their position on the rack.

Unless it is reasonably sharp, no tool, however clean, can be used without effort. Spades and hoes, particularly the push type, are the most important in this respect. All tools can be sharpened easily and quickly if a good file is available. The illustrations on page 309 show how the file should be held and used when sharpening a spade. Hoes and shovels can be sharpened in a similar manner.

Push type or Dutch hoes should be sharpened on the upper edge only and draw type or chop hoes sharpened on the forward edge. Spades and shovels should be sharpened on the back edge.

No garden implement should be sharpened on both sides.

Torpedo or fish-tail hoes are often sharpened on both the leading and trailing edges, as this makes it easier to destroy weeds when the hoe is passed sideways between plants in the rows.

Orderly Tool Shed

An orderly tool shed is pleasant to work in and tools tossed into a corner are difficult to sort out when required. There are many types of tool racks, all of which assist in keeping the shed tidy and add to the life of the tools. Shelves or cupboards should be set aside for articles such as garden lines, vegetable seeds (which should be stored in vermin-proof containers), files, labels, and spray materials.

Spray materials should be kept out of reach of young children, as almost all of them are toxic. If they cannot be stored on high shelves, they are best locked in a cupboard.

All onions, tubers, and pumpkins and squashes stored in the shed should be in positions where damage to them is not likely to occur during winter. However, they should be stored so that periodically they can be checked over easily for storage rots and attack by vermin.

An abundance of tools is not necessary and only those required for major jobs should be purchased. A good range of tools for the average home garden is shown in the upper illustration on page 309. The mechanical cultivator may be unnecessary in some gardens, but saves many hours of hand hoeing. Price ranges at present for these tools are:—

Spade, 27s. 6d.-35s.
Rake, 6s. 6d.-10s. 6d.
Draw hoe, 9s.-14s. 6d.
Torpedo hoe, 10s. 6d.-14s. 6d.
Scarifier, 18s. 6d.-30s.
Digging fork 18s. 6d.-30s.
Potato fork, 18s. 6d.-30s.
Mechanical cultivator, £3 15s.-£14
Watering can, 18s. 6d.-37s. 6d.
Narrow trowel, 2s. 6d.
Wide trowel, 2s. 3d.
Wooden labels, 12in., 17s. 6d. per 100
Hand fork, 3s. 6d.-6s. 6d.
Garden line (fishing line), 4s. 6d. per hank
File, 3s. 9d.
Garden hose, ½in., 1s. 2d.-1s. 8d. per ft.
Sprinklers, 2s. 6d.-£5

Photographs on this and opposite pages by R. W. Orr.

Spray Equipment

Some type of spray equipment is essential in a home garden if diseases and pests are to be kept to a minimum. It is also necessary to have the equipment in good order if spraying is to be done quickly and efficiently.

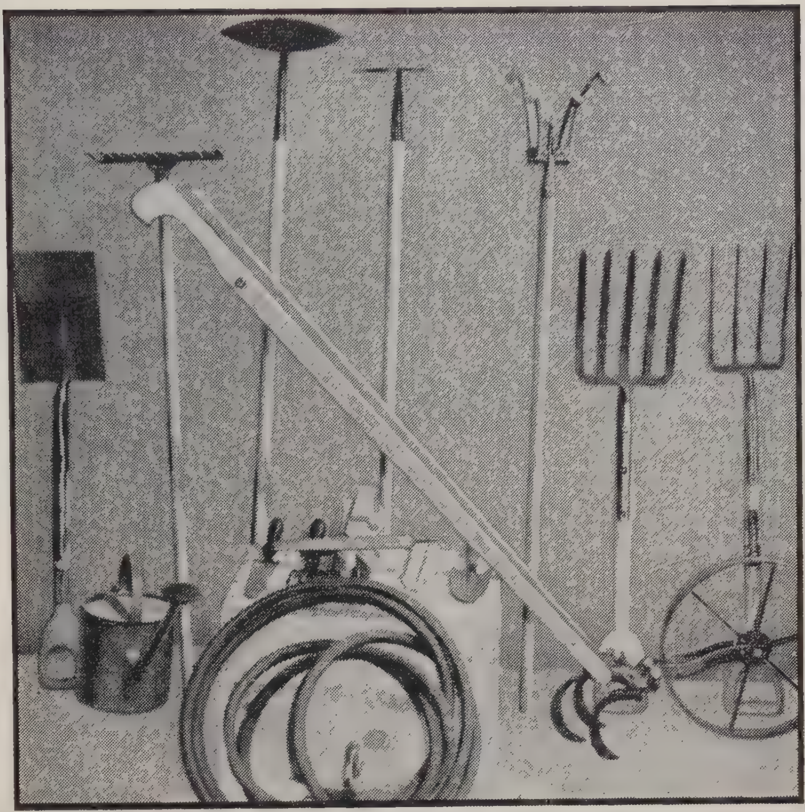
All appliances should be cleaned out after use, and at this time of the year some larger repair jobs may be necessary. Washers on all types may need renewing and hose lengths on bucket pumps or knapsack sprayers should be replaced if perished. Leaking hoses or joints reduce greatly the pressure of such pumps and thus their effectiveness.

One common occurrence with spraying appliances is the blocking of the nozzles. This is often caused by inefficient strainers, particularly on bucket pumps and knapsack sprayers. The strainer at the base of the bucket pump should be renewed, if necessary, and any holes in the strainer of the knapsack sprayer sealed up. It is also a good plan to take all nozzles apart and clean them thoroughly to remove any threads or particles of dirt. All spraying equipment should be stored in a position where it is not likely to be damaged.

Bonfires Have Disadvantages

At this time when much clearing of refuse is being done, gardeners are sometimes faced with the problem of disposing of considerable quantities of vegetation. The easy way out is to burn it and scatter the ashes over the garden. Unfortunately, although a bonfire saves time, much of value is lost from the material so treated. All plant refuse that is not diseased should be returned to the soil fresh or as compost. This is essential if the structure of the soil is to be maintained. Burning reduces the vital organic structure of the refuse which is so essential to soil improvement. However, the ash remaining is valuable as a fertiliser, as it contains in inorganic form most of the elements originally contained in the plant. The two major elements remaining are calcium and potash, but much can be lost by leaching, so that ash to be of full value as a fertiliser should be collected when cool and stored in a dry place until required.

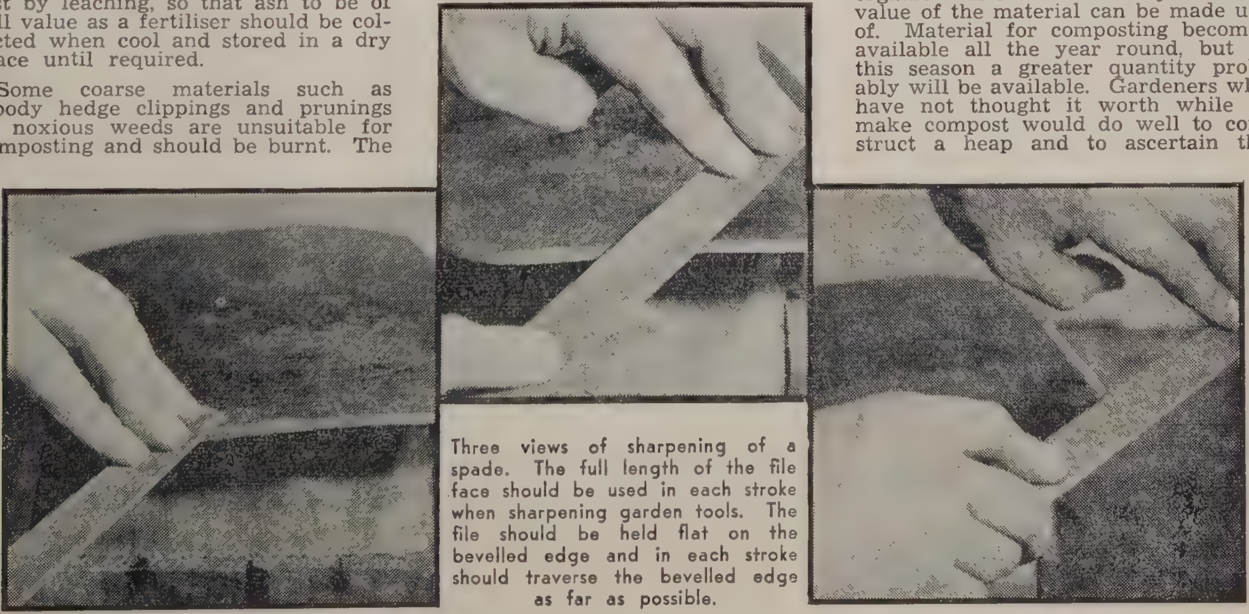
Some coarse materials such as woody hedge clippings and prunings or noxious weeds are unsuitable for composting and should be burnt. The bonfire area can be kept neat and tidy if an old 40-gallon drum is used as an incinerator; one set up is shown in the illustration on page 313. In this instance a low, three-sided concrete foundation was constructed and iron rods fitted on to it. Both top and bottom were removed from the drum before setting it in place. Although this drum is in a permanent position, it is always tidy and the ashes can be added readily to the adjacent compost bins.



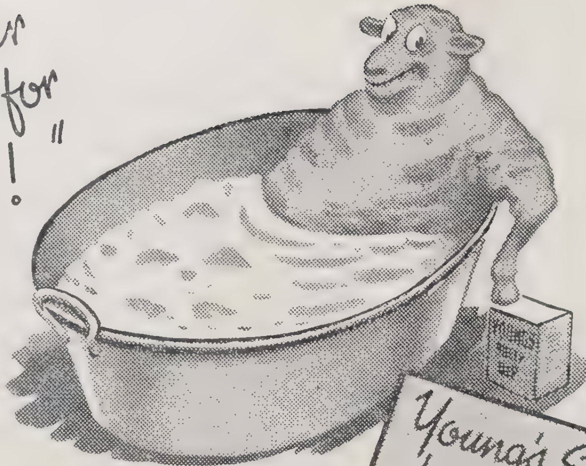
A wide range of tools is unnecessary; those shown represent all that are required for all major operations. Only sturdy tools should be purchased.

Composting

Composting is a more satisfactory alternative to the bonfire for using organic waste. In this way the full value of the material can be made use of. Material for composting becomes available all the year round, but at this season a greater quantity probably will be available. Gardeners who have not thought it worth while to make compost would do well to construct a heap and to ascertain the



Three views of sharpening of a spade. The full length of the file face should be used in each stroke when sharpening garden tools. The file should be held flat on the bevelled edge and in each stroke should traverse the bevelled edge as far as possible.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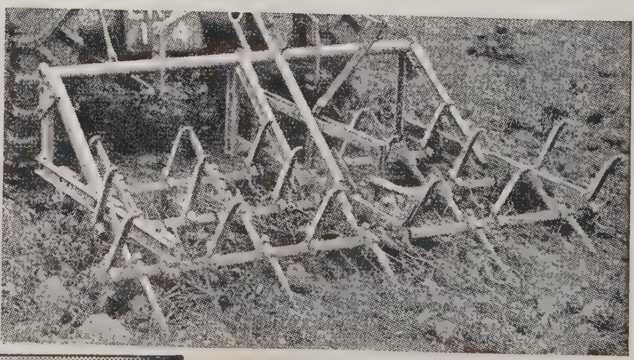

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amount of valuable material made available from it.

[*Photo News Ltd. photo.*

Compost heaps are best built in the shelter of hedges or fences. This reduces drying out by winds or leaching of nutrients by rain.

What to Compost

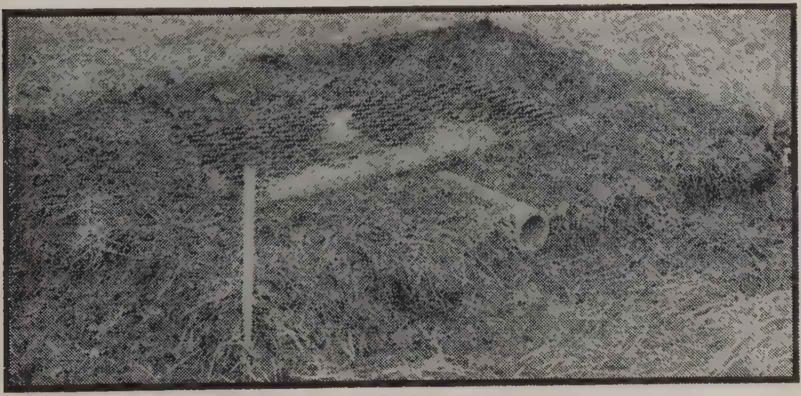
Practically all materials can be composted, but the following are best burnt or otherwise disposed of: Virus-infected and insect-infested materials, perennial weeds, materials containing paints, creosote, and oils, glass, plastics, and printed matter.

For best results plant refuse should be mixed with animal refuse such as stable manure or poultry manure. Besides giving a more balanced compost the manures assist in the breakdown of the plant material. Materials such as sawdust, shavings, and straw are all valuable in the compost heap, but should be used sparingly, and in any case should be mixed well with animal refuse or fresh plant refuse such as lawn clippings. All household refuse such as peelings, tea leaves, and food scraps, including bones, build up in quantity in a surprisingly quick time and provide valuable material for composting. The rubbish tin should therefore contain nothing but coal ash, tins, bottles, and the solid materials mentioned previously.

Building the Heap

The compost heap is best built in the most sheltered part of the garden, such as under a shelter tree or on the sheltered side of a hedge or shed. This will guard against leaching of plant foods by heavy rains or excessive drying out by winds.

The compost heap is best built directly on the surface of the soil. If the soil is heavy and drainage poor, a layer of very coarse material such as hedge clippings or shavings should be laid down first. If drainage is good, a shallow depression can be dug to coincide with the area of the heap. The heap can then be started in this. Aeration of a heap is important, and, if it is not efficient, the breakdown of the material will not be thorough. The illustration below shows how an old bed wire has been used to assist aeration. The bed wire can be stood on bricks, and to ensure that air reaches the centre a field pipe or length of metal down-piping should be fitted as shown. Some means of preventing vermin from entering the heap should be fitted to the outer end of the pipe. The heap can be begun around the ventilating apparatus. The size of a heap also governs the speed of breakdown. If a heap is too large, air may not reach the innermost layers; if it is too small, the material may dry out rapidly and the heat generated by the micro-organisms is lost rapidly from the relatively large surface area. For best results heaps should be at least 1 cub. yd.



[*Sparrow Industrial Pictures Ltd. photo.*

An old bed wire used to provide ventilation in a compost heap. Material can be built directly on the grid.

The order in which materials are incorporated can vary considerably, but a few points should not be overlooked. Green or fresh material should be alternated with dry material such as straw. Animal or poultry manure should be alternated with other materials and, if possible, mixed with straw, sawdust, shavings, and other dry matter. A suggested order would be:—

1. Coarse material as a foundation.
2. Finer vegetable matter 6in. thick.
3. Straw or other dry materials, dampened and lightly trampled, 1ft. thick.
4. Animal manures 3in. thick or a generous sprinkling of nitrogenous fertilisers.
5. Soil or compost about 1in. thick.

To ensure alkaline conditions and thus encourage micro-organism activity lime should be incorporated. It can be applied with the soil or sprinkled lightly over the coarser materials. This can be done also with the nitrogenous fertilisers, such as dried blood or blood and bone. Layers can be repeated as material becomes available. If little animal manure or fresh material is available an activator will be necessary for satisfactory breakdown. This can be made up by mixing sulphate of ammonia, superphosphate, muriate or sulphate of potash, and lime in the ratio of 4 : 3 : 1 : 2 parts by weight. A liberal sprinkling of activator on each layer of plant refuse will assist breaking down. All dry material such as hay is best lightly tramped down, as it then comes into contact with the activator better and also tends to hold more moisture. The same material probably will require the addition of water.

If heaps are large, a rake handle or similar object can be built into the heap in a vertical position about 1ft. from the base. When the heap is completed the rake handle can be withdrawn and the vent remaining will assist in improving aeration. To exclude flies and vermin the heap should be coated with a layer of soil about 2in. thick. If the sides have been built to taper gradually to an apex, the soil will remain firm and the finished heap will shed excessive moisture. If desired, a covering of iron can be fixed, but a watch should be kept to see that the heap does not become too dry. If the heap appears to attract flies, it can be sprayed with a D.D.T. preparation.

Turning

To break down organic matter efficiently micro-organisms require ample supplies of air and moisture. This is why good ventilation and ample moisture content in the original plant refuse are recommended. If heaps are too large, are packed too tightly, or are not moist enough, breakdown can be slowed up considerably. Also, breakdown may not be as rapid in bins constructed of brick or concrete or during the cooler periods of the year.

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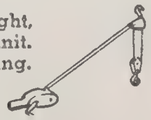

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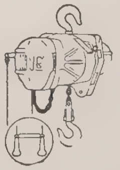

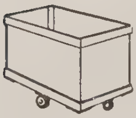

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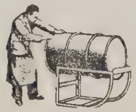

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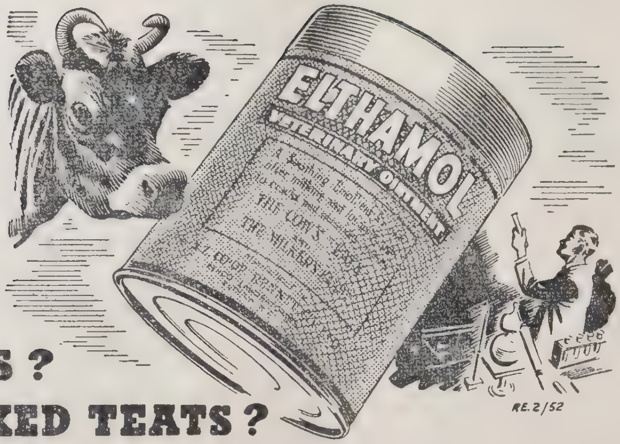

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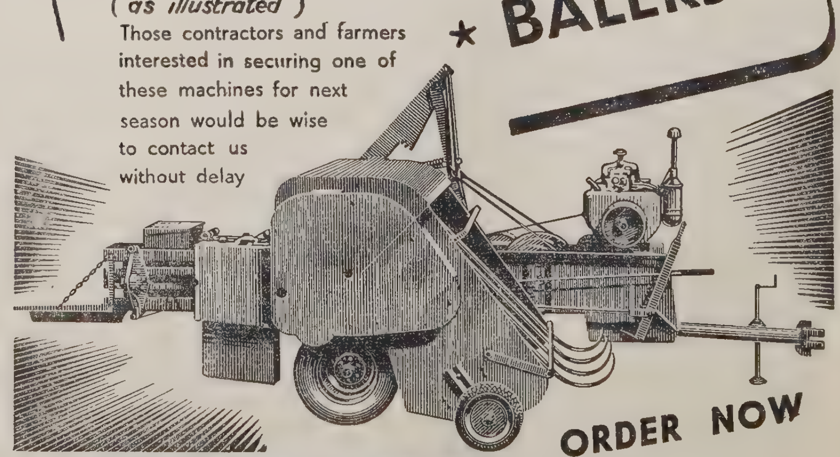

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Partial breakdown only will occur if correct conditions are not maintained and the resultant compost will contain much material of a woody nature. Compost in such condition no doubt would be valuable for improving the texture of light or clayey soils, but for other types of work it might be too coarse.

To ensure more complete breakdown or to speed up the process turning may be necessary. Temperatures in compost heaps or bins can easily rise to 150 degrees F. In about 4 or 5 weeks the temperature usually falls about 40 or 50 degrees and it is at this stage that the heap can profitably be turned. Turning should be done so that the outside of the heap is deposited on the inside of the new heap or bin. If the material is dry, it should be watered until moist but not wet. The fall in temperature indicates a slowing down in bacterial action and the turning increases aeration, which encourages renewed bacterial activity.

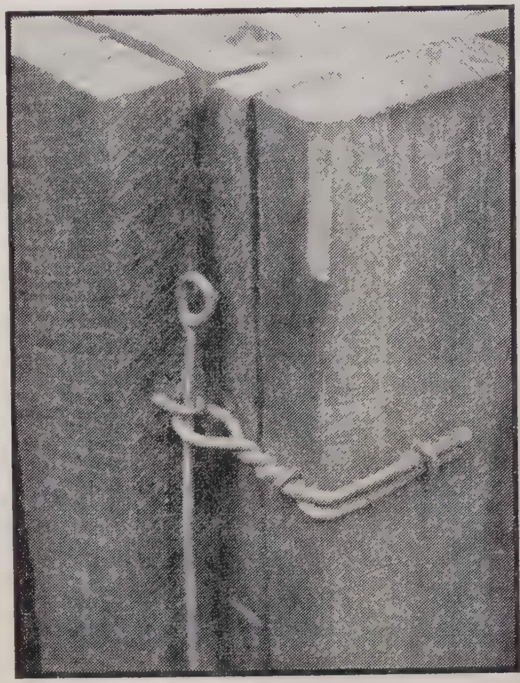
Turned heaps should be rebuilt to a shape similar to the originals. If a series of three bins is used, it is possible to have matured compost in one, maturing compost in the second, and fresh material in the third.

Compost Bins

Although compost heaps can be made to look tidy, compost bins are neater. Bins also provide better means of turning the compost and are less likely to allow the entry of vermin or flies. They also guard against excessive leaching of plant foods, notably nitrogen.

Bins can be constructed from packing cases, loose timber, old oil drums, bricks, or concrete. The ideal type is a series of two or three bins all opening to one side so that any one can be worked independently of its neighbours. Each bin can of course be constructed separately, and this would be easy with cases or drums. If bins are to last, they should be constructed from durable material.

Many designs can be adopted, but with all ease of access is important. A very simple design is partly illustrated at right. Each bin consists of four collapsible sides fastened together as illustrated. Two opposite sides can have the wire loops attached toward each corner and heavy gauge staples can be driven in the positions illustrated on the remaining two sides. A length of No. 8 wire makes a suitable locking device and runs through both bottom and top loops at each corner of the bin. The complete bin can be dismantled by withdrawing the four lengths of wire.



[*R. W. Orr photo.*

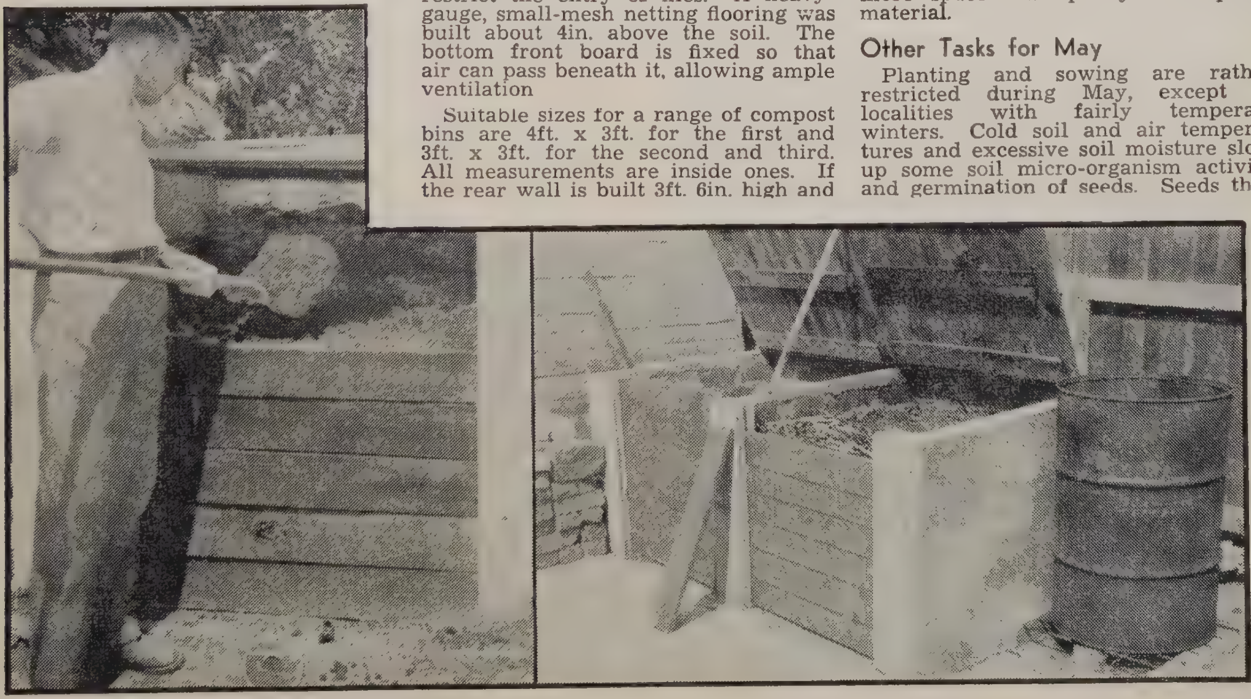
Use of this locking device made from No. 8 fencing wire and heavy staples is a simple but efficient method of holding together the four collapsible sides of a compost bin.

Some gardeners will no doubt have quantities of used bricks available which would make admirable and durable bins such as those illustrated below. The very neat bins at right have grooves moulded into corner posts to take movable front boards. Besides facilitating turning from one bin to another the movable fronts allow easy removal of small lots of compost when required. The hinged lids keep out excessive moisture and restrict the entry of flies. A heavy-gauge, small-mesh netting flooring was built about 4in. above the soil. The bottom front board is fixed so that air can pass beneath it, allowing ample ventilation

Suitable sizes for a range of compost bins are 4ft. x 3ft. for the first and 3ft. x 3ft. for the second and third. All measurements are inside ones. If the rear wall is built 3ft. 6in. high and the front wall 3ft. high, sloping lids can be fitted when convenient. Extra volume for the first bin is recommended, as raw material takes up more space than partly decomposed material.

Other Tasks for May

Planting and sowing are rather restricted during May, except in localities with fairly temperate winters. Cold soil and air temperatures and excessive soil moisture slow up some soil micro-organism activity and germination of seeds. Seeds thus



[*R. W. Orr photos.*

Left—The use of narrow, movable boards in the front of a bin allows small amounts of compost to be removed easily as required. Note the base ventilator pipe (in circle). Right—This excellently constructed combination of compost bins and incinerator made from a 40-gallon drum has proved efficient in a home garden. Note the hinged lids to exclude excess water from the bins and the narrow spaces below the fixed bottom boards.

checked are subject to attack by soil fungi, a common cause of poor germination of peas during early spring.

Planting

Lettuce plants can still be planted in milder districts. Raised beds will assist in keeping the soil reasonably warm and dry. To keep up steady growth a liquid fertiliser may be necessary. Quick-acting ones such as nitrate of soda are beneficial and can be applied at the rate of 1oz. to 4 gallons of water through the watering can.

Spring cabbages and cauliflowers not transplanted last month in favourable localities can be set out now. Soil for these plants should be rich in decomposed organic matter. The soil can if thought necessary be built into low ridges 24 to 30in. apart and the plants set along these at about 18in. intervals. If growth is slow during subsequent weeks, an application should be made of the fertiliser recommended for lettuce.

Silver beet plants can still be set out in northern districts. They are gross feeders and do best on very rich soil. Organic matter or a fertiliser made up of 3oz. of superphosphate, 2oz. of dried blood, 1oz. of sulphate of ammonia, and ½oz. of sulphate of potash a square yard should be incorporated. If a further winter boost is needed, the liquid fertiliser already mentioned can be applied.

Sowing Seed

Peas can be sown in small quantities where soil conditions are particularly favourable. Low ridges will assist in warming and draining the soil. Germination can often be improved by treating the seed with a seed-dusting preparation before planting. Mercuric or copper-sulphate-based compounds are considered the most effective. An easy method of treatment is to put a good pinch of the compound with the seed into a closed container. A few seconds' vigorous shaking will coat the seed.

Spinach is a vegetable that thrives during the cooler periods of the year, and if soil and climatic conditions are at all suitable, a sowing can be made now. If growth appears slow, the spinach should be treated with liquid fertiliser in the same way as lettuces.

Radish seed of turnip-rooted varieties can be sown, preferably in raised beds. As this vegetable does not stand in good condition for very long when once mature, small sowings are best made about every 4 weeks. Radishes should be grown quickly if they are to be of good quality.

Reminders

Remaining tubers of kumaras, potatoes, Jerusalem artichokes, and yams, if matured, should be harvested.

If root crops are still in the soil, they should be checked for possible disease attack and lifted if necessary.

All tubers and bulbs must be stored carefully as outlined in the February issue. Asparagus beds should be cleaned up and fern growth removed, if this was not done last month.

All vine crops should be harvested before risk of damage by frosts.

A further sowing of broad beans can be made, if the soil is not too wet, in double rows in wide drills made with a draw hoe blade.

In harvesting of brussels sprouts the lowest sprouts should be removed first.

Liquid manure should be applied to leeks not yet matured and they should be earthed up to lengthen and bleach the stems.

Weeds should be kept down in all plots, particularly seedling beds, special attention being paid to perennial weeds.

Old crops such as tomatoes, beans, and cabbages should be cleared and vacant plots dug over.

All stakes used for tomatoes, peas, and beans should be collected, tied neatly in bundles, and stacked in the shed until required.

Crops for next growing season should be planned and the aim should be to have various types, such as legumes, roots, and leaf vegetables, in different plots from the previous season.

It is best not to work the soil if it is very wet. This applies particularly to heavy types such as clays.

☆

Reduction of Soft Rot in Stored Carrots

EXTENSIVE losses are caused by bacterial soft rot (*Erwinia carotovora* (Jones) Holland) in vegetables during transit and in store. Vegetables form an excellent medium for the growth of bacteria, but for their development the bacteria must have access to the internal tissues and have suitable incubation conditions. In this article D. W. Dye, Plant Diseases Division, Department of Scientific and Industrial Research, Auckland, describes the results of tests of chemical methods of controlling the disease.

INJURIES in vegetables are an almost inevitable result of harvesting operations and handling. High temperature and humidity regularly develop in confined spaces and greatly promote the growth of bacteria. The resultant "sweating" or condensation not only favours bacterial development and invasion but also moistens dead wound tissues and facilitates infection through such channels.

Chemical Bactericides

Refrigeration greatly reduces bacterial spoilage of produce, but as there is no general provision of refrigeration for vegetables in transit or in store in New Zealand, protection by chemical means would be advantageous. To be effective a bactericide for post-harvest treatment must be able to reach soft-rot organisms which are already deposited on the surface of the host. It must not damage the product and the residue must not be toxic to man. Because of possible deleterious effects on vegetables as human food, the chemical must not penetrate the host tissue. It must be safe to use, inexpensive, and easily applied. The germicide may be in the form of a gas or a wash. As water is often used in the preparation of vegetables for market, treatment could be conveniently applied as a wash. Experiments have been carried out to test the value of dipping bagged carrots in various compounds. As an additional treatment some carrots were thoroughly sun dried.

Results of Chemical Tests

It was found that Bordeaux 6 : 8 : 100 (copper sulphate 6lb., hydrated lime 8lb., water 100 gallons) and 12 : 16 : 100, "Cuprox" 3lb. and 5lb. in 100 gallons, "Copper Sandoz" 2½lb. and 5lb. in 100 gallons, "Perenox" 5lb. in 100 gallons, and copper zeolite 5lb. and 12lb. in 100 gallons were very efficient in protecting carrots from soft rot in the presence of large numbers of responsible bacteria and under conditions of temperature and humidity favourable for their development. In tests a comparison of two concentrations of materials showed that there was little difference between them. Exposure to bright sunlight sufficient to dry the carrots thoroughly gave as good a protection from soft rot as did the copper solutions. The practicability of the sun-drying method would, however, depend on the weather and on the amount of surface moisture at the time of harvesting, and its efficiency would depend on whether the carrots were turned to allow all-over sun drying.

"Phygon" 1lb. and 2lb. in 100 gallons, "Arathane" 2lb. in 100 gallons, "Venturicide" 2lb. in 100 gallons, and water treatments proved ineffective in preventing soft-rot decay.

"Phygon", "Arathane", Venturicide", and the sun-drying and water treatments had no effect on the appearance of carrots. "Perenox" and "Copper Sandoz" treatments caused a barely noticeable light-brown deposit on the roots. Bordeaux, "Cuprox", and copper zeolite treatments left a noticeable blue or green deposit, which could not be regarded as seriously affecting the vegetables' appearance for market. No treatment gave any detectable taint to the roots, which were scraped and cooked in the normal way.

Success of Copper Compounds

Thus it has been found that the copper compounds tested were toxic to the soft-rot organism and did not damage the product, and that any residue on the cooked roots was not toxic to man. There was no noticeable penetration of these solutions into the tissue and no detectable taint, and they were safe to use. Most of these materials are readily available and relatively inexpensive. It is recommended therefore that when soft-rot infection is expected, particularly in heavily infected areas during wet or humid weather, post-harvest chemical treatments be applied to control the disease during transit of the vegetables and when they are in store. It is suggested that before they are sent to market bagged carrots be dipped in Bordeaux 6 : 8 : 100, "Cuprox" 3lb. in 100 gallons, "Copper Sandoz" 3lb. in 100 gallons, or "Perenox" 5lb. in 100 gallons of water. The choice of a material would be governed by availability and cost.

Pasture Topdressing in the North Island

By C. DURING, Assistant Investigating Officer, Department of Agriculture, Wellington

THE merits of basic slag as a phosphatic fertiliser have been much discussed. Comprehensive experiments with this by-product of the steel industry were carried out overseas late in the 19th century and as a result the use of basic slag was recommended on soils rich in organic matter, soils not too dry, and on clay soils responsive to lime. Sir E. J. Russell in his bulletin "Artificial Fertilizers in Modern Agriculture" observes that clay land usually responds better to the application of slag than any other type of soil, particularly if the original vegetation contains clovers or allows for the spread of clovers.

IN New Zealand in 1912, when already a considerable number of experiments had been carried out with basic slag and basic slag mixtures, B. C. Aston, then Chemist of the Department of Agriculture, wrote in the "Journal of Agriculture" as follows: "Basic slag of all substances most nearly realises the pastoralist's dream of a magic something the touch of which should clothe the languishing earth with a perennial verdure". Less lyrically in another article in the same year he stated the conditions under which basic slag seemed most beneficial to pastures. Aston considered that it required a climate with well-distributed rainfall; that it was better on clay soils than on sandy soils (although the coarse sandy pumice soils of the North Island were greatly benefited by slag); and that it was an alkaline fertiliser containing an excess of lime, and as most New Zealand soils are deficient in lime, he considered that they should respond to slag.

Since 1912 many experiments have been conducted with basic slag. Most of them, about 400, were observational pasture topdressing trials, but some were mowing trials from which accurate records of pasture production were obtained for a number of years.

Observational pasture topdressing trials are usually conducted for 3 years. During this time the vigour, palatability, and pasture species composition of the various plots are noted. Though these features give in most cases a good indication of pasture responses, it is possible that on first-class pastures capable of high production without the aid of fertilisers differences of 25 per cent. in pasture production can escape the eye of the trained observer, but on poor pastures responses of this magnitude are less likely to be missed.

Northland

A comprehensive review by E. H. Arnold of fertiliser requirements and responses of Northland pastures based on observational topdressing trials was published in the "Journal of Agriculture" for February 1951. The information can be summarised as follows:—

1. **On pastures which have not received adequate lime:** On such pastures basic slag has given responses inferior to those from superphosphate or serpentine superphosphate on the moderately weathered and quite fertile consolidated sands of the west coast, and probably also on the limestone hills, although experimental evidence from these is less complete. On the other hand basic slag is usually superior to superphosphate and other phosphatic fertilisers on the more fertile volcanic soils derived from basalt, on the more fertile brown and grey clays derived from sedimentary rock, on the old terraces which once were alluvial flats, and, to a minor extent, on the more recently formed alluvial clays and meadow soils.

On some soils basic slag is very much better than other phosphatic fertilisers. These include the more leached and infertile basalt soils, all soils derived from dolerite and andesite rock, and the poor gumland clays. Much of the superiority of basic slag lies probably in a lime effect, for all soils of Northland except the consolidated sands need lime to carry good pasture.

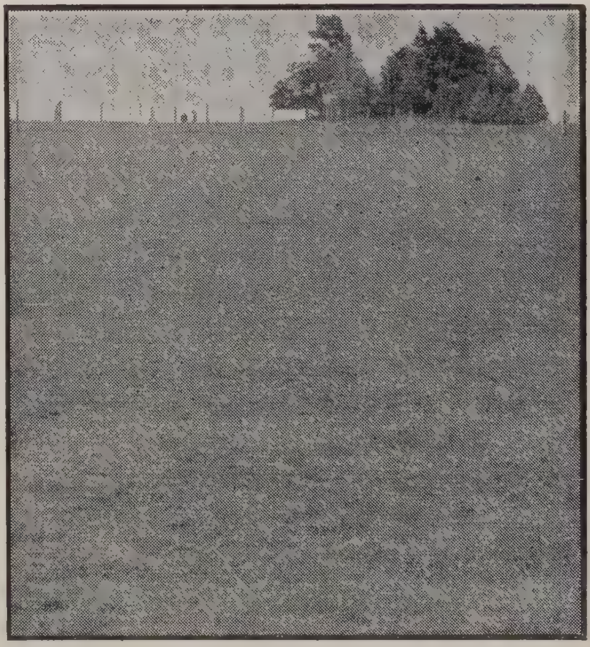
2. **On pastures which have been adequately limed:** When adequate amounts of lime have been applied basic slag has given equivalent results to superphosphate on old alluvial terraces, on the clay and meadow soils from more recent alluvium, and on the better gumlands and clays.

In some soils, however, basic slag maintains its superiority over superphosphate even in the presence of applied lime. On volcanic soils, that is, soils derived from basalt, andesite, and dolerite, basic slag seems a little better than superphosphate even on well-limed pastures. The same seems true of the very poor sandy and pipe-clay gumlands.

South Auckland District

The most important soils of South Auckland, Waikato, and Rotorua-Taupo districts are derived from volcanic ash. The central plateau is covered with Taupo pumice and related ash showers. Pumice has also been deposited by rivers in the Waikato basin and in the Matamata district and is in places mixed with alluvium derived from the sedimentary rocks such as sandstones, limestones, and mudstones. To the west of the pumice country, from Ohura to Huntly, andesitic ash (the Mairoa showers)—somewhat similar to the ash of Taranaki—covers most undulating country and hills. North of the Mairoa showers the older andesitic Hamilton showers have formed an important series of soils.

Hamilton and Mairoa ash showers: Soils derived from the Hamilton showers cover most undulating country from Ohaupo northward to Tuakau, Pukekohe, and Patumahoe. They appear as brown clay loams on red-brown or red clayey subsoil with a tendency to dry out badly in summer. The Mairoa showers influence soil types from Ohaupo southward to Taumarunui County. Along the west


The Big Hill field, Ruakura, where the early departmental trials with basic slag were carried out.

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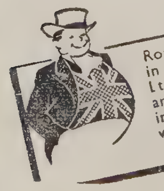

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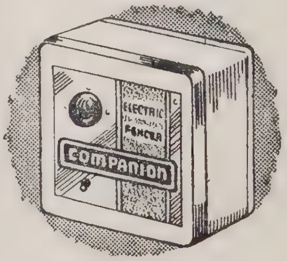

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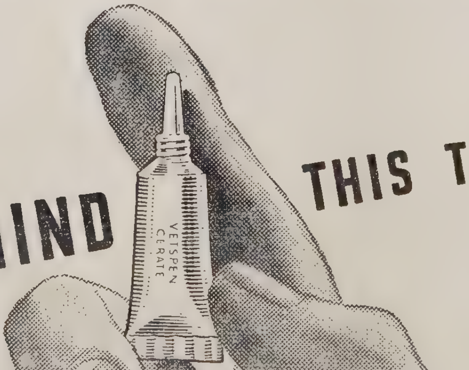

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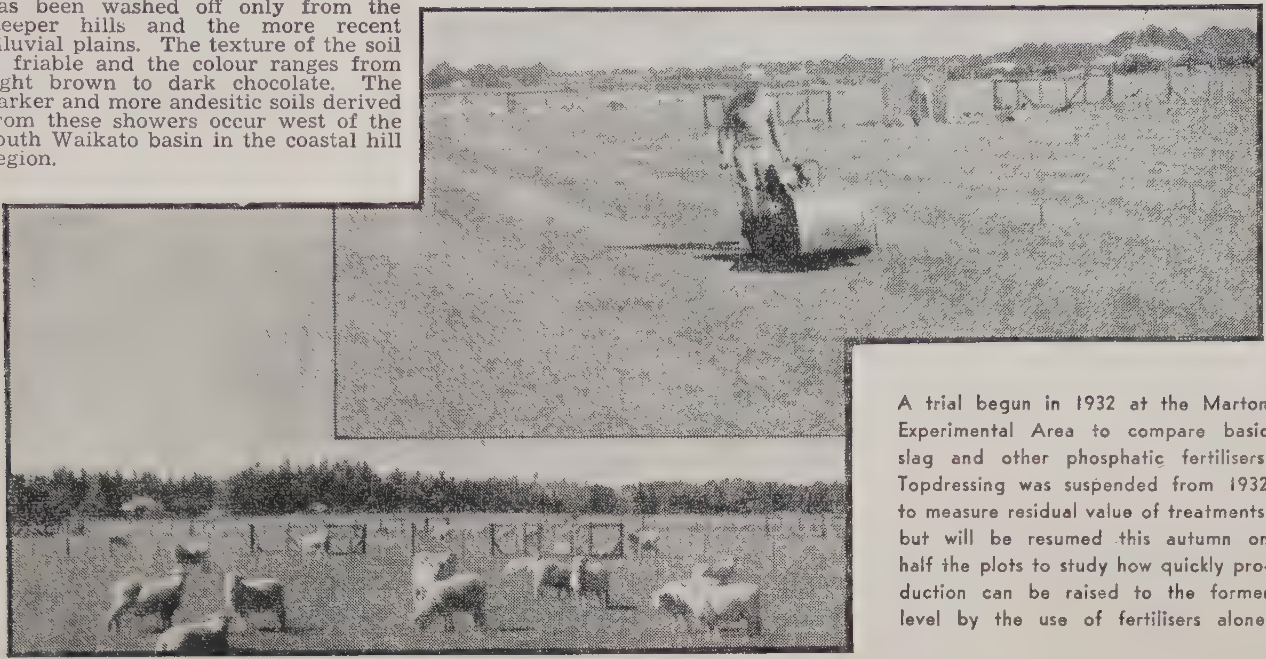
coast from the Mokau River to Raglan Mairoa ash has also covered all undulating and slightly hilly country and has been washed off only from the steeper hills and the more recent alluvial plains. The texture of the soil is friable and the colour ranges from light brown to dark chocolate. The darker and more andesitic soils derived from these showers occur west of the south Waikato basin in the coastal hill region.



A trial begun in 1932 at the Marton Experimental Area to compare basic slag and other phosphatic fertilisers. Topdressing was suspended from 1932 to measure residual value of treatments, but will be resumed this autumn on half the plots to study how quickly production can be raised to the former level by the use of fertilisers alone.

Both Mairoa soils and Hamilton soils react similarly to basic slag. On ground requiring liming basic slag appears at least equal to and sometimes slightly better than superphosphate or serpentine superphosphate. When adequate liming is carried out, however, superphosphate and serpentine superphosphate seem to be slightly the better fertilisers. What applies to Mairoa and Hamilton soils applies equally to their alluvial derivatives, which are found south of Manukau Harbour and in the Henderson-Hobsonville district.

An attempt was made to correlate progressive stages of leaching with basic slag response, because it was thought that basic slag might be better on the higher-rainfall areas than on the lower-rainfall areas, but no evidence was found to support this. In the Hamilton soils, however, one trial found basic slag superior to superphosphate on limed and unlimed pastures. This trial was situated on Churchill clay loam, a very leached and poor soil derived from Hamilton ash and pumice alluvium.

Pumice soils: A large area in the Putaruru, Rotorua, and Taupo districts is covered with soils derived from Taupo ash. These soils respond to lime only rarely. Perhaps for this reason basic slag appears more frequently to be inferior than superior to superphosphate and serpentine superphosphate, but the difference is only slight. In general, therefore, basic slag can be regarded as being as good a fertiliser as the more soluble types on the pastures of these districts.

Volcanic ash soil of the Bay of Plenty: On these soils derived from the Kaharoa, Waihi, and Whakatane showers, basic slag does not seem to be suitable. Even at its best in the slightly lime-responsive soils of the Waihi district basic slag seldom equals superphosphate in efficiency.

Hill soils of Auckland Province: The hill soils derived from underlying sedimentary rock tend to vary greatly within any one district. A very large number of trials are therefore necessary to cover all variations in hill soils and this is impracticable. General tendencies in pasture response to basic slag can, however, be observed, but they are as yet of limited practical value.

Basic slag without lime seems superior to superphosphate without lime on the well-weathered but only moderately leached and often quite fertile hill soils of Raglan, Manukau, and Franklin Counties, but little difference is seen when pastures are adequately limed. Only on one observational trial, near Whangamarino, on very poor and leached hill clay resembling Northland gum soils was basic slag found to be definitely better than superphosphate on limed and unlimed pastures. Strangely enough, however, on the poor leached hills of Coromandel no difference could be seen between superphosphate and basic slag. Both gave good pasture responses.

Much further south near Ohura trials have been conducted on quite fertile hill soils which have undergone less weathering than related soils in the north. Here basic slag was equal to superphosphate.

Recent alluvial soils and meadow soils: Though the Hauraki Plains represents the largest area of these soils, pockets of alluvial and meadow soils are found in all districts. In general no differences in pasture response have been observed between basic slag and superphosphate.

Remainder of North Island

The remainder of the North Island, for the purpose of observational pasture trials, extends southward from the East Cape, the Raetihi-Ohakune district, and the Mokau River. In the northern part of this region soils derived from various showers of volcanic ash are important. Taranaki soils are developed from various showers of andesitic ash. The Ohakune-Raetihi district was covered with ash showers from Mt. Tongariro and the Taupo eruption. On the east coast from Tokomaru Bay to Eskdale various Taupo pumice showers have influenced soils on the easier hills and rolling country.

1. **Volcanic soils of the Ohakune district:** These soils are developed under an average yearly rainfall of 70in. Pastures respond well to liming and good results from basic slag on unlimed ground could therefore be expected. In fact basic slag appears to be very slightly better than superphosphate under such conditions, and is equal to superphosphate on pastures which have been adequately limed.

2. **Volcanic soils of Taranaki:** Basic slag is popular in Taranaki, and a great number of observational trials comparing superphosphate with basic slag have therefore been carried out. In south Taranaki and the coastal districts of Waitotara County there is evidence that basic slag alone is slightly better than superphosphate alone; where lime dressings were applied, however, no differences between the two fertilisers were detected. In north and central Taranaki, in the higher-rainfall belt, observational trials have failed to establish any superiority of basic slag.

3. **Recent alluvial flats:** This group covers a wide variety of soils. The soils vary from the heavy, often badly drained soils of high fertility found on the east coast and Hawkes Bay to the barren stretches of shingle and stones along some of the Hawkes Bay rivers. On the whole, where a pasture response to phosphates can be detected the quick-acting fertilisers seem slightly better than basic slag.

4. **Older alluvial soils:** These are mainly "light plains" soils such as in the Takapau-Ruataniwha flats in south

Wairarapa and in the Horowhenua areas. A comparison of basic slag and superphosphate on this soil series is difficult, because a large number of differing climatic conditions are involved. Large differences in response between basic slag and superphosphate have never been noted, however, and it can be said that the two fertilisers have equal merit on limed and unlimed pastures on these soils.

5. **Yellow-grey earths:** This class of soils has developed under the lowest-rainfall conditions in the North Island and is distinguished from related types by the limited amount of leaching of soil nutrients which has taken place and by higher natural fertility.

These soils are divided into the more friable and least leached soils of the undulating hills of central Hawkes Bay and the more compact and relatively more leached soils which are typified by the rolling country near Marton. The latter soils often suffer from poor winter drainage, but tend to dry out fairly quickly in the summer. Information is available only on this more compact class of soils. On the Marton Experimental Area accurate trials measuring pasture production under various phosphatic fertilisers have been studied. Here basic slag without lime is found to be as good as or slightly better than superphosphate or serpentine superphosphate without lime. On limed pastures there is little difference in the three fertilisers. In one trial the residual value of basic slag alone was found to be a little, but not significantly, better than that obtained on superphosphate alone. Observational trials on the whole confirm the Marton results.

6. **Hill soils:** Hill soils derived from underlying sedimentary rock tend to vary greatly from paddock to paddock and from district to district. This makes an evaluation of fertiliser responses difficult. In general it can be said that on no hill soils has basic slag yet been found to give the outstanding results which are obtained on some of the hills in Auckland Province, particularly where kauri was a mature constituent of the original flora. In Wellington Province most hill country trials have shown a response to lime, but there are quite a few exceptions. Superphosphate and lime plots have been the best, followed by basic slag and lime. On unlimed ground sometimes superphosphate and sometimes basic slag has appeared to give the greater pasture improvement. There are, however, too few trials of this type to enable definite conclusions to be formed. It is of course desirable that more information on the best usage of available phosphatic fertilisers in hill country should be sought. This is being done at present and observational topdressing trials on hill country are being laid down in increasing numbers. It will be several years, however, before enough data will be accumulated to enable the most efficient phosphatic fertiliser for any particular type of hill soil to be named.

Basic Slag-superphosphate Mixtures (Equal Parts)

In 1912 a mixture of superphosphate and basic slag was officially recommended, probably for the first time, by B. C. Aston in the "Journal of Agriculture". Heating of the mixture and subsequent setting into a hard, concrete-like mass were avoided by mixing the two fertilisers in the paddock just before spreading. This, of course, entailed a great deal of inconvenience and it may be mainly for this reason that the basic slag-superphosphate mixture has gone out of favour.

Records of early trials with this substance are scanty, but results from 12 trials carried out about 1930 are preserved. These show that in the Reporoa district the basic slag-superphosphate mixture was slightly but consistently better than either basic slag or superphosphate alone. One very comprehensive and carefully conducted observational trial on the former experimental farm at Puwera, Northland, situated on poor gumland soil, revealed a rather remarkable superiority of this mixture over most other treatments. The basic slag-superphosphate mixture (equal parts) was compared with either fertilisers alone, with superphosphate plus annual dressings of 3cwt. of lime, and superphosphate plus 1 ton initial dressing of lime. All phosphatic fertilisers were applied annually at 3cwt. per acre. The mixture compared well with the plots receiving superphosphate plus 1 ton of lime and appeared much better than the rest of the treatments.

Conclusion

The results of observational pasture topdressing trials indicate that basic slag compares well with other phosphatic fertilisers on a large number of agriculturally important soils in the North Island. In the main these are soils on which pastures respond well to the application of lime. The performance of basic slag is therefore attributed in part to its high lime content. This opinion is borne out by the fact that where adequate liming is carried out serpentine superphosphate and superphosphate frequently appear slightly superior to basic slag.

In many North Auckland soils, however, and possibly in some of the poorer hill country of the South Auckland and Raglan districts, basic slag is outstanding when applied on unlimed land and is still slightly better than other well-tested phosphatic fertilisers on limed land. The reason for this is not known. Possibly the answer may lie with the trace elements present in basic slag. Strongly weathered soils, that is, soils of high clay content, seem to respond better to slag than weakly weathered soils, and this is particularly so where strong weathering is combined with high phosphate fixation.

In the North Island rainfall seems to have little influence on the utilisation of basic slag by pastures. This is probably so because almost everywhere rainfall is sufficient and beyond a certain point additional moisture makes little difference to the solubility of slag in the soil.

References

"Basic Slag", Department of Agriculture Bulletin No. 26, B. C. Aston (1913).

Legend to series of soil maps of the North Island, Soil Bureau, Department of Scientific and Industrial Research (unpublished).

"Volcanic Ash Showers", Journal of Science and Technology, Vol. XII, No. 4, L. I. Grange (1931).

Radio Broadcasts

RADIO broadcasts to farmers will be given as follows during May:—

1YA Auckland, 7.15 p.m.

7 May—"Farm Drainage", by D. F. Scott, Machinery Instructor, Department of Agriculture, Auckland.

14 May—"Planting of Trees on the Farm", by J. P. Burrell, Assistant Farm Forestry Officer, Department of Agriculture, Wellington.

21 May—"Nitrogen on Pastures", by J. R. Adams, Instructor in Agriculture, Department of Agriculture, Pukekohe.

28 May—Talk arranged by Northern King Country District Committee of the Federation of Young Farmers' Clubs.

1XH Hamilton, 12.30 p.m.

1 May—"Care of the Sow during Winter", by P. J. McCann, Veterinarian, Department of Agriculture, Hamilton.

8 May—"Nitrogenous Fertilisers", by J. R. Murray, Instructor in Agriculture, Department of Agriculture, Hamilton.

15 May—"Feeding of Household Poultry", by W. L. McIver, Poultry Instructor, Department of Agriculture, Hamilton.

22 May—"Prospects for the Coming Season", by D. J. Carter, Dairy Section, Federated Farmers, Hamilton.

29 May—"Winter and Early-spring Fruit Tree Spraying", by C. E. K. Fuller, Orchard Instructor, Department of Agriculture, Hamilton.

1YZ Rotorua, 7.15 p.m.

1 May—"Winter Pasture Management", by G. A. Blake, Instructor in Agriculture, Department of Agriculture, Matamata.

15 May—"Diseases of the Pregnant Ewe", by P. J. McCann, Veterinarian, Department of Agriculture, Hamilton.

29 May—'Some Thoughts on the Seasonal Problems of Dairy Farmers", by C. R. Taylor, Fields Instructor, Department of Agriculture, Rotorua.

3YA Christchurch

1 May (7.15 p.m.)—"Pasture Control", by L. Blackmore, Instructor in Agriculture, Department of Agriculture, Timaru.

8 May (7.15 p.m.)—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Fields Instructor, Department of Agriculture, Rangiora.

19 May (12.20 p.m.)—"Establishing a Poultry Unit", by C. J. Goldsmith, Poultry Instructor, Department of Agriculture, Christchurch.

29 May (7.15 p.m.)—"Selection and Planting of Pip, Stone, and Bush Fruits", by M. Baumgart, Orchard Instructor, Department of Agriculture, Christchurch.

4YA Dunedin, 7.20 p.m.

5 May—"Principles of Pruning Fruit Trees", by J. Coombe, Orchard Instructor, Department of Agriculture, Roxburgh.

21 May—"Wintering of Hoggets", by C. A. Martin, Inspector of Stock, Department of Agriculture, Tapanui.

4YZ Invercargill, 7.15 p.m.

5 May—"Hydatids", by J. P. Anderson, Veterinarian, Department of Agriculture, Invercargill.

12 May—"Care with Farm Machinery", by J. N. M. Whyte, Farm Machinery Instructor, Department of Agriculture, Dunedin.

19 May—"Care of Bees in Winter", by S. Line, Apiary Instructor, Department of Agriculture, Invercargill.

26 May—"Winter Feeding of Dairy Stock", by the Livestock and Extension Divisions, Department of Agriculture, Invercargill.

Other Broadcasts

1YA Auckland, Tuesdays at 12.35 p.m. and Wednesdays at 7.15 p.m.; 1YD Auckland, Thursdays at 7.30 p.m.; 1XN Whangarei, Mondays and Wednesdays at 8.10 p.m.; 2XA Wanganui, Thursdays at 8 p.m.; 2XG Gisborne, Tuesdays at 8 p.m.; 3XC Timaru, Wednesdays at 8.5 p.m.

Plant Frame for Seedlings

A NEW TYPE of container for the growing of seedling plants called the plant frame is being used successfully in Auckland by a number of growers of both indoor and outdoor tomatoes and by some nurserymen. In this article the plant frame is described by S. O. Gillard, Vegetable Instructor, Department of Agriculture, Auckland.

PLANT FRAMES are manufactured from timber veneer similar to that used for strawberry chips, punnets, or pottles. They consist of oblong strips of wood scarfed cross-wise in four places; these scarfs are placed so that they allow the frame to be bent easily to form a bottomless box with four square sides and an overlap of 1in. around the corner where the ends come together. They can be made up simply and quickly. To keep the frame in shape when it is being made up a rubber band can be placed round the middle of the frame or a paper clip may be used. Some nurserymen prefer to staple frames with a stapling machine by placing one thin wire staple near the top and one near the bottom of the fold.

To suit most requirements plant frames are manufactured in three sizes, which range as follows:—

Frame	Size in flat	Size when made up
No. 1	13in. x 4in.	4in. deep x 3in. square
No. 3	11in. x 3in.	3in. deep x 2½in. square
No. 5	9in. x 2½in.	2½in. deep x 2in. square

Box of tomato plants 5 weeks from pricking out.

The frames are designed for use in standard seedling trays measuring 12½in. x 16in. (inside measurement) and accommodate the following number of plants (frames) to a tray:—

No. 1, 20; No. 3, 30; No. 5, 48.

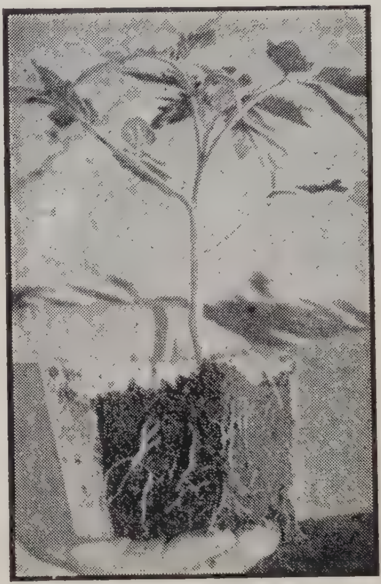
Preparation for Planting

Frames when made up are placed side by side in the seedling tray. Prepared potting soil is then shovelled over the tray containing the empty plant frames and shaken down and levelled off. Next water is applied and this compacts the soil sufficiently for the setting of the young seedlings or seeds. When plants are large enough for replanting the frames are removed or, if desired, they can be set out with the plant.

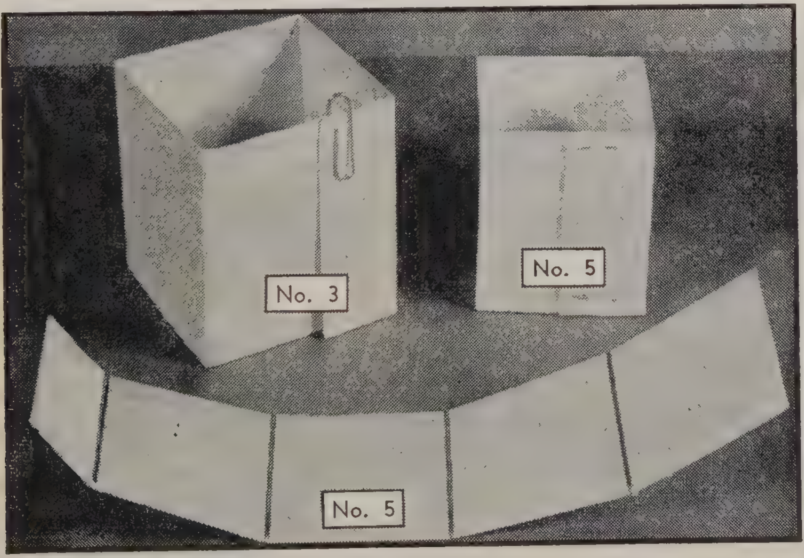
Advantages of Method

This plant frame method of plant propagation has many advantages over the system of growing seedlings in trays, and in many instances the frames can take the place of small pots. Some of the main advantages of the system are:—

1. It facilitates even spacing of the plants in the seedling box.
2. Moisture is retained for a longer period than if plant pots were used, as there is no space for evaporation between plant containers.
3. Watering is made easier, as each frame will take its quota and the water does not tend to flow to one side as with the ordinary seedling tray.
4. If disease organisms, such as foot rot fungus, are in one portion of soil, they cannot travel as readily from one part of the tray to another as they would in the ordinary seedling tray.
5. Plants can be removed easily from the seedling tray with less likelihood of damage to their roots.
6. The soil remains attached to the plant roots when plants are removed from the seedling tray and this assures quicker establishment.
7. When plants become crowded in the seedling tray and more room between the plants becomes necessary some can be removed easily without disturbing the remainder.
8. Plant frames are much cheaper than any other suitable type of plant pot at present available.



Frame opened up to show root development of a tomato plant and the compact block of soil attached to the roots.



A No. 5 plant frame in the flat (at front), showing scarfs across the timber to facilitate folding; a No. 3 plant frame with paper clip attached to hold the shape (left, at back); and a No. 5 plant frame held in shape by two staples (right, at back).

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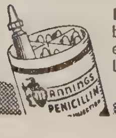
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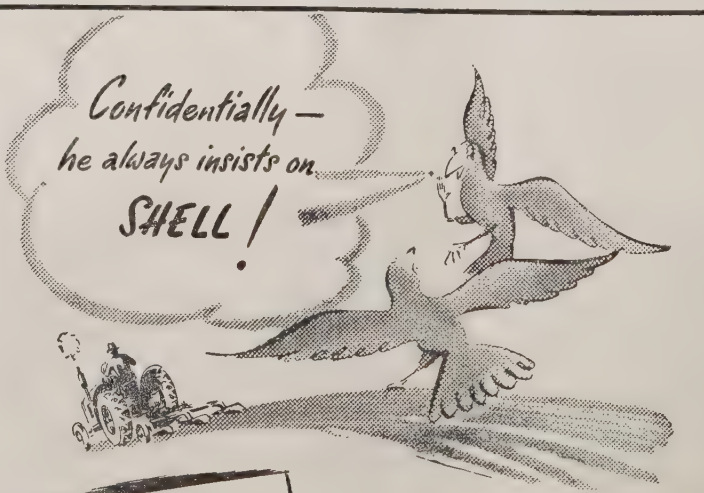
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Wintering of Bees and Care of Stored Bee Combs

Seasonal Notes for the Domestic Beekeeper

HAVING REMOVED the last of the surplus honey stored by the bees during the honey season, beekeepers should now turn their attention to doing something for the bees to ensure their comfort and survival until next season. This article, contributed by the Horticulture Division, describes the fundamentals of successful wintering of bees and care of stored bee combs.

A domestic apiary in a well-sheltered, sunny, and airy position.

UNFORTUNATELY many beekeepers fail to give their bees proper attention at the close of the honey season, which often results in preventable loss of bee stocks and apiary equipment, which are costly to replace in time for the following season's operations.

The chief requirements for successful wintering of bees are disease-free colonies strong in young bees, close-fitting, rain-proof hives, adequate supplies of food, and protection from prevailing winds. Failure to fulfil any of these conditions is fatal to safe wintering of bees.

Food Requirements

Strong colonies headed by good queens housed under dry conditions and provided with adequate stores of honey and pollen are capable of surviving the most severe winters in any part of New Zealand without attention during winter. Some beekeepers fail to appreciate the value of stored pollen to their bees, especially when plant life is dormant.

Though nectar is the principal source of carbohydrate in the food of the honey bee, pollen is the source of all other food required by the bee for growth and reproduction within the hive. Pollen contains carbohydrates and fats in addition to other elements, but its most important constituent is protein. It is important, therefore, not to strip a hive of pollen in autumn and attempt to carry bees over to the next season on combs of honey alone.

In autumn it is best under New Zealand conditions to remove surplus honey stored above the second hive box only. Thus it is possible to leave each colony one super of fully capped combs of honey in addition to any honey and pollen stored along the upper and outer edges of combs in the brood nest below, which provides an extra margin of safety in food supplies.

All supers and bee combs above the second box should now be removed from the hives until they are required again next season. Special care should be taken to protect the combs against wax moth.

Wet Bee Combs

The safe storage of bee combs is a problem to beekeepers who have no special, bee-proof store room.

Wet combs, after extraction of the honey, may be placed back on the hive over the hive mat, with one corner of the mat turned back to allow the bees access to the wet combs so that they can clean them. The combs may then be removed for storage after a few days. In autumn no attempt should be made to place wet combs to be cleaned back on the hives in daytime. The work should be done in late evening as quietly and quickly as possible to prevent undue disturbance of the bees. It is also advisable for any beekeeper situated in a closely settled area to wash the outsides of the supers clean of all traces of liquid honey before placing them out in the apiary; otherwise robbing and general disturbance of the bees may occur.

Control of Wax Moths

Precautions against wax moth damage should begin this month. Careless beekeeping methods may encourage wax moths to breed, and where hives are neglected and become weak in bees they are soon invaded by these pests, especially in the warmer parts of New Zealand. The moths also attack bee combs in storage, and unless such combs are adequately protected, much damage and loss may occur. Because of the feeding habits of wax moth larvae, it is good practice to sort combs for winter storage into three classes. Empty brood combs, combs containing pollen, and new empty combs should be spaced widely—not more than 8 combs to each box—and kept in separate stacks with a sheet of newspaper between each box and the next.

Domestic beekeepers are not usually able to store bee combs in a special moth-proof room, but if the above precautions are taken and the combs are kept in tight-fitting boxes stored in a cool place, a minimum of damage will be done by moths. Another method is to place tight-fitting hive boxes containing the combs in a cool, airy place with a fine-mesh wire gauze cover at top and bottom of each stack to allow a free circulation of cool air between the combs at all times. If stacks are in the open, the top of each should be covered sufficiently to keep the combs dry.

Complete protection of bee combs may be provided by the use of certain chemicals, particulars of which may be obtained from local apiary instructors of the Department of Agriculture.

Protection from Winds

When hives are in exposed positions cold, penetrating winds enter hive entrances and all openings caused by ill-fitting or badly constructed appliances.

A site exposed to sunlight and sheltered from prevailing winds is the most economical protection that can be given to colonies of bees. Where winters close in comparatively early it is also advisable to reduce each hive entrance to about 5/16in. by 3in. with an entrance cleat or block after the bottom board has been cleaned thoroughly of all debris. This allows any dead bees to be removed rapidly and thus keeps dampness and formation of mould on combs to a minimum.

If apiaries are given the treatment already described and each colony has a good queen and goes into winter quarters fairly strong in young bees, hives should require no further attention until early spring.

Use of Forage Harvester for Stack Silage and Chou Moellier

THE VALUE of the forage harvester for making pit silage was discussed in the July 1950 issue of the "Journal". In this article J. N. Whyte, Farm Machinery Instructor, Department of Agriculture, Dunedin, describes two further uses of this equipment—making stack silage and cutting and chopping chou moellier.

PROVISION of silage and green fodder crops for supplementary feeding is of particular importance to dairy farmers, especially to those engaged in town milk supply on the Taieri Plain, where grass production is restricted by climatic conditions to approximately 8 months each year. In some cases stall feeding is carried out, so that labour costs and convenience are important in considering stock food supplies. As only the few farmers on the higher ground above average plain level can use pits or trenches for silage, the bulk of this fodder must be made in stacks. Because of the difficulty of securing labour for silage making and the arduous job of feeding out, often under extremely unpleasant climatic conditions in winter, keen interest has been taken in equipment which lightened these tasks. Demonstrations in the field had shown that the forage harvester and trailer outfits could reduce the labour force and cost of silage making and that good-quality fodder resulted from the chopped material, which was relatively easy to feed out.

Chou moellier crops averaging 4 to 6ft. high, in which lodging is not uncommon, formerly were cut and loaded by hand for feeding out on pastures or in sheds. The new equipment, with some local adaptations, has proved capable of dealing satisfactorily even with lodged and tangled crops and thus has reduced the time and heavy labour previously involved.

Above—Cutting and chopping a good grass crop. Below—Chou moellier being cut, chopped, and loaded in one operation at walking pace.

Stack Silage

In a field demonstration in 1949 the forage harvester performed satisfactorily in heavy grass and clover crops, the length of chopped material varying from 1½in. to 4in. The material was transported in a home-made trailer, unloaded at the stack site, and lifted with a 3-tine, engine-driven grab up to a round stack 18ft. in diameter. A team of three, one operating the tractor, forage harvester, and trailer, one unloading the trailer and working the grab, and the third building the stack, carried out the work efficiently and expeditiously. The quality of the silage was good and the material was much easier to feed out than where unchopped grass and clover were processed. The following points were noted from this demonstration:—

The team of three with the forage harvester could carry out silage making with a smaller labour force and much more conveniently than when the old method of mowing and transporting unchopped material was used.

Time could be saved in cutting, loading, and transporting with the trailer by traversing the paddock so as to form a loop; this avoids crushing uncut material and enables the tractor driver to secure a trailer load with the minimum of travel.

The roof and door of the trailer should be covered with scrim to ensure retention of chopped material and the door should be hinged at the top to facilitate rapid unloading.

The 3-tine grab was inefficient in retaining chopped material and the addition of 2 tines appeared warranted.

Stacking with the short, chopped material was difficult and an increase in length would be advantageous.

The 18ft.-diameter stack was too narrow to permit safe building.

Illustrations on opposite page. 1—Unloading a trailer by anchored wire rope and forward movement of trailer. 2—Five-tine grab. 3—Hay grab operated by engine-functioned winch. 4—Stacking chopped silage of 2½in. average length. The stack at right is well settled and sealed with shingle. 5—Stack of chopped silage partially fed out. Where the seal of shingle has fallen off (above the fork at right), due to poor compaction, the fodder is of poorer quality. 6—Feeding out chopped silage, which can be handled much better than long material. 7—Chopped chou moellier being delivered into the trailer from the chute. The fodder is not large enough to constitute a danger to cattle from choking.

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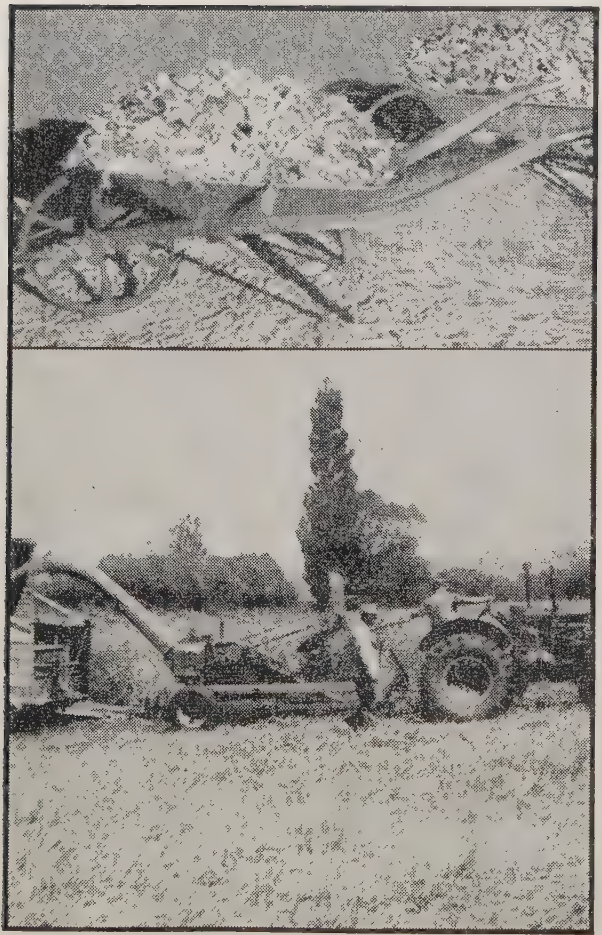
Forage harvester operating in a heavily lodged and twisted crop of chou moellier.



Upper—Chopped chou moellier ready for feeding. Lower—Cutting and chopping a heavy, lain crop of oats on a Taieri Plain farm.

A forage harvester purchased in 1950 by a dairy farmer was efficiently operated by a 3-man team, which with improved technique and modified equipment built 22ft.-diameter stacks rapidly. Modifications included increasing the length of chopped material to an average of approximately 4in.; this was done by removing 2 of the 4 cutters and reducing the speed of cutter revolutions. Two additional tines were added to the grab, making it a 5-tined implement, and these modifications resulted in easier lifting and more satisfactory stacking of material. A further improvement was the replacement of canvas on the trailer roof and door with scrim. Unloading was considerably accelerated by having the door swinging from the top. Even with the wider (5-tined) grab the material was spread easily and evenly and no difficulty was experienced in stacking by the usual methods for silage making. An occasional raking down was sufficient to ensure straight sides, and a canvas sheet was used as a windbreak when necessary. It was found that a diameter of 22ft. was greater than could be stacked satisfactorily with the equipment, so that in future the size of stack will probably be reduced to 20ft. diameter.

Good-quality silage was processed, the advantage of easy feeding out again being demonstrated. There is no doubt that the purchase of the forage harvester on this farm, where cows are stall fed mainly on home-grown fodder for some months each year, has been a good investment.

Chou Moellier

Cutting, transporting, and feeding out chou moellier, usually under cold, wet conditions, is probably one of the most unpleasant jobs on a Taieri dairy farm. On the heavy alluvial Taieri Plain soils crops up to 6ft. in height and 2in. in stem diameter are not uncommon, and at times lodging and tangling add to the difficulty of utilisation. The usual method is to cut with a slasher, manhandle on to a sledge, trailer, or cart, and feed out either on a pasture or in a shed. If the forage harvester could be operated satisfactorily, its advantages were obvious, and although some difficulties were experienced, especially in tall, tangled crops, all can now be utilised efficiently. The operation is trouble-free in standing crops, where even the tall, heavy-yielding areas can be cut, chopped, and broken into about 2in. lengths.

After various modifications had been tried it was found that even lodged and tangled material could be dealt with by attaching a scythe blade along the extended divider horn. As the chopped material heats if kept for more than 48 hours, cutting is completed in the afternoon and the fodder is spread out on a floor if not fed within 48 hours. The chopped chou moellier was relished by the cows, which showed no sign of choking or of digestive troubles. The time and labour saved by the use of the forage harvester on this important fodder crop add to the value of the recently introduced equipment.

Apricot Culture

AMONG the numerous kinds of fruit which can be grown successfully in New Zealand the apricot (*Prunus armeniaca*) ranks high in popularity. It is discriminating as to climatic and soil conditions, and these factors, together with other aspects of its culture, are discussed by J. Coombe, Orchard Instructor, Department of Agriculture, Roxburgh, in this article, which will be concluded in the May issue of the "Journal".

Apricot trees in bloom.

THE apricot is one of the most useful hardy fruits in that it can be used as a fresh fruit, for jam making, or preserved or dried for winter use. At one time it was thought to be a native of Armenia, but further study suggests that its native habitat was farther east in western China, and some strains known as Russian apricots appear to have come from Siberia. The Chinese are reputed to have cultivated apricots 3000 years B.C. W. H. Chandler states that the apricot was introduced from Italy into England in the 13th century, and was grown in Virginia as early as 1720. The first trees in New Zealand were imported from Australia in the early 1860's and planted at Clyde, Central Otago. More trees were imported a year later, and these were planted at Coal Creek, Roxburgh. Central Otago is still the main apricot growing centre in New Zealand, there being about 93,400 trees in that district at 31 March 1951 and 26,100 trees in the remainder of the fruit growing areas of New Zealand.

Location

Apricot trees favour a locality with a wide variation between summer and winter temperatures, and for this reason Central Otago, with its sharp dry cold in winter and hot dry summers, is ideal for them.

Districts subject to humid conditions during spring and early summer are not suited for apricot growing, as brown rot develops rapidly. An attack of this disease during blossoming can cause a serious loss of potential crop.

A site that is reasonably well sheltered from the south and has a northerly aspect is preferable to one with a southerly aspect.

Apricots come into blossom early in spring (early September in a normal season), and from this period until the fruit has developed to the size of a walnut they are very susceptible to damage by frost. In the dormant stage the flower buds of most varieties are as resistant to cold as peach buds, but they swell more quickly when warm day temperatures are experienced and are therefore more subject to damage during frosty nights. Unless a grower is prepared to provide protection, or to risk frequent loss of crop, localities subject to spring frosts should be avoided.

Soil

Although apricots are propagated on various types of root stocks, apricot, peach, and plum, which make them suitable for varying soil types, they prefer deep, loamy, well-drained land. They will not tolerate a heavy, retentive subsoil, as they very quickly succumb to "wet feet".

In Central Otago the best-quality fruit is produced from trees growing in schist rock soils, particularly those which contain a reasonable amount of weathered rock. In soils of this type the trees produce good crops over a long period of years. Some trees are stated to be from 75 to 80 years old and are still in a good, vigorous condition and bearing heavy crops.

A thermometer fastened to a post in an open space in an orchard.

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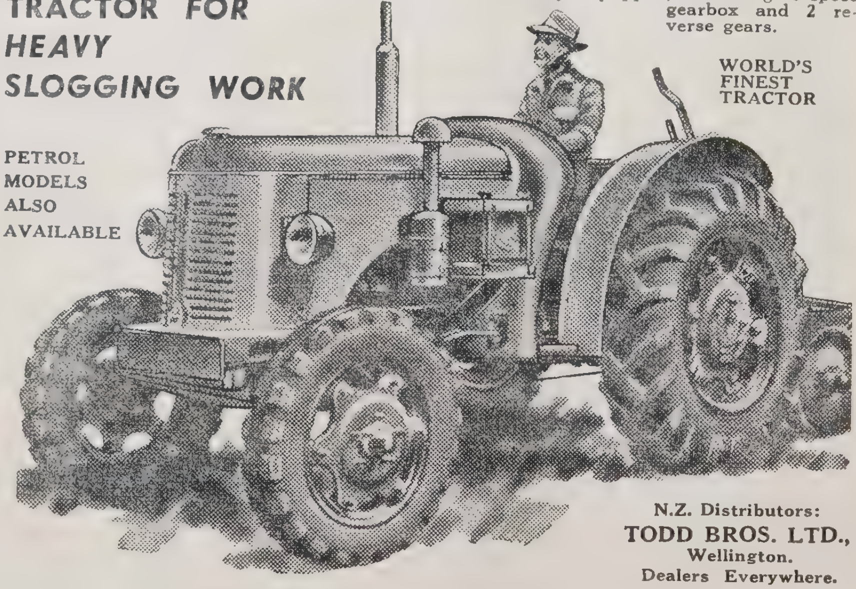

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Drainage

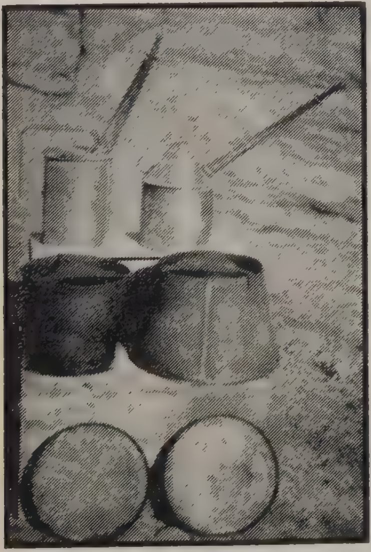
If the drainage is not adequate, it should be attended to before planting is started. Like the roots of most other fruit trees those of apricots will penetrate to a good depth if the soil is suitable; it is the drainage of the subsoil, where the deep roots are, that is so important. Because water is not seen lying on the surface of the soil, it does not mean that it is well drained. In some soils surface water is rarely seen, yet the soil is waterlogged a few inches below the surface. The fertility and physical condition of a waterlogged soil deteriorate rapidly and much more cultivation is required to break it down to a good tilth.

The depth and distance apart at which drains are laid are governed by the outlet and the type of soil. Tile, brush, or stone drains are efficient if properly constructed; if they are placed 4ft. deep and a chain apart, adequate drainage should result on free-draining loamy soils. In heavier soils, drains must be shallower and closer together. Land which cannot be drained readily should not be used for apricot growing.

Irrigation

The importance of irrigation in districts of low rainfall cannot be stressed too strongly. If soil moisture is insufficient while the crop is growing, individual fruits will be small and inclined to be tough and dry; during pronounced drought conditions fruit will sometimes wither on the trees. Tree growth, fruit bud development, and storage of food in the tree parts also suffer if there is a continued lack of soil moisture throughout the summer, giving the tree a check from which it may take a year or two to recover.

If soil moisture is lacking, water should be applied shortly after fruit set, and again after the stone has hardened; irrigation should be avoided when the stone is hardening, as fruit drop may result.



The fire-pot on left holds 10 pints of fuel and that on right 21 pints. Lids and spiders are interchangeable. The lighting torch on left is the latest design.

Fire-pots set out in an orchard ready for lighting to protect the crop from frost.

After the crop is harvested irrigation is often neglected, but at this stage when the buds for the following season's crop are maturing and the tree is building up food reserves, a plentiful supply of moisture is necessary. However, trees should not be irrigated too late in the season, as this tends to retard ripening of the fruit buds and young growths, making them more subject to low-temperature injury in winter.

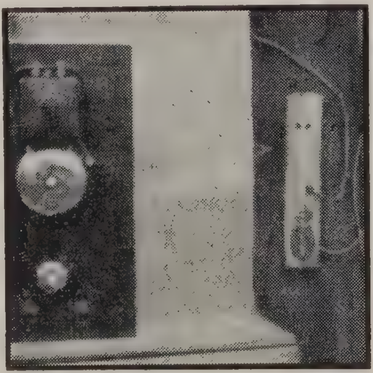
When irrigation has to be resorted to sufficient water must be supplied to reach the rooting system if good results are to be achieved. In most instances water is led down small furrows from the main irrigation channel and then allowed to spread out over the soil. A departure from the use of furrows is irrigation through sprinkler systems, though very little is known at present as to whether this method will be likely to create conditions more favourable for the development of disease.

Shelter

Shelter from strong winds does not appear to be quite as important for apricots as it is for some other kinds of fruit. Many successful growers have very few or no shelter trees round their orchards. If the locality is exposed to very strong winds, some shelter should be provided, but a block of apricots should not be so hemmed in that no wind can penetrate, as it is likely to make conditions worse for the development of brown rot. Further, if the orchard is on a slope and in an area subject to frosts, a shelter belt on the low side increases the frost risk by holding up natural air drainage. Where protection from strong winds is essential Lombardy poplar or one of the *Pinus* species can be recommended as quick-growing trees suitable for the type of shelter needed.

Cultivation

Although clean cultivation is recommended for apricot growing, it does not mean that no weeds should be allowed to grow. The land should be broken down to a reasonable tilth in early spring just before bud movement and left undisturbed until after



A frost-alarm thermometer attached low down on a post, and the alarm box operated by it, which is fitted in the orchardist's bedroom.

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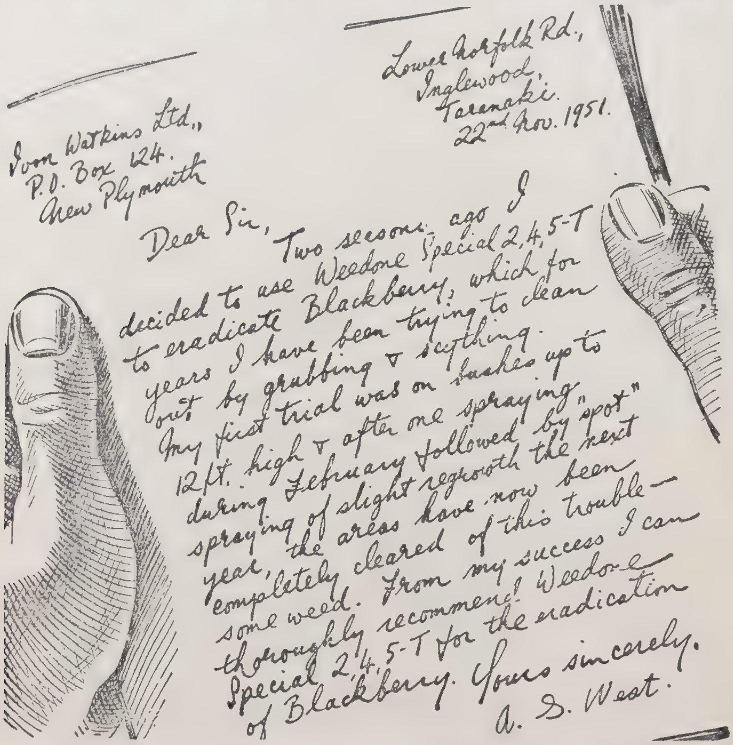

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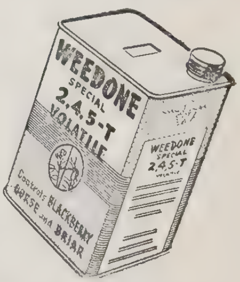

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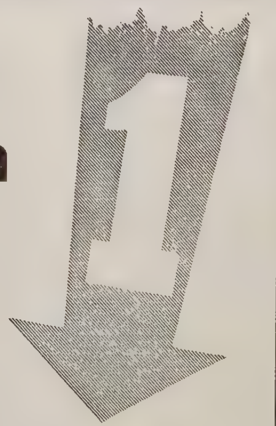

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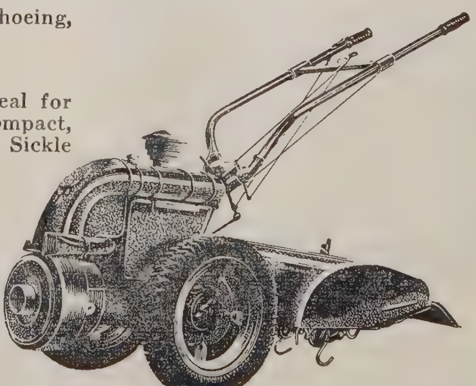

the frost risk period has passed. A cover crop or heavy weed growth at this period increases the risk of having the crop frosted. Throughout the summer light, shallow cultivation should be carried out to keep down excessive weed growth, which robs the trees of soil moisture.

About mid-January a cover crop should be sown to assist in keeping the organic content of the soil at a high level. Oats, barley, ryecorn, and blue lupins are all useful plants as cover crops. Seed is sown at the rate of 1½ to 2 bushels per acre. In sowing the cover crop it is advisable to apply 2cwt. of superphosphate mix per acre to assist it to become established as rapidly as possible.

In low-rainfall districts, such as Central Otago, the growing of cover crops can rob the fruit trees of essential moisture if adequate irrigation is not available. Many growers are now using straw or hay spread over the soil in late spring at approximately one bale per tree to maintain the humus content of the soil under these conditions. This material is well rotted down by the following spring, when it is worked into the soil. This strawing down is also beneficial in areas where cover crops cannot be grown successfully.

Cover crops or mulches should be incorporated in the soil sufficiently early for them to have rotted completely before bud movement of the trees begins. When such material is breaking down it tends to cause a temporary shortage of available nitrogen in the soil. If a cover crop must be turned in at this stage, when nitrogen starvation would be detrimental to the trees, a quickly available nitrogenous fertiliser, such as sulphate of ammonia, should be broadcast to maintain the nitrogen supply.

Soils of a fairly heavy type should be ploughed up to the trees on both sides in autumn and left in the rough through winter, when the action of frosts will assist greatly in making them easier to work. On heavy soils the run-off of surface water is greatly facilitated if a deep furrow is left in the centre of each row after ploughing.

Manuring

The quantity and quality of fruit produced from an orchard depend largely on the fertility of the soil and its management, and through the judicious use of fertilisers a high level of soil fertility can be maintained.

No definite recommendations can be made as to the quantity of any particular fertiliser that should be applied to orchard trees; the fertility of the soil and the vigour of the trees, which vary considerably, determine the amount and kind of fertiliser required to ensure maximum production.

If any one of the three main elements, nitrogen, phosphorus, or potassium, is in very short supply, this deficiency will show in the foliage; therefore the condition of the tree is the best guide as to what fertiliser should be used.

Nitrogen promotes strong wood growth, larger foliage, and assists in the setting of fruit. The tree's requirement of nitrogen is greatest in the early part of the growing season, and it is usually at this period that it is in short supply, particularly if a green crop or straw has been incorporated in the soil and is in an unrotted condition. An excess of nitrogen is liable to cause soft, sappy growth and make the tree more susceptible to an attack of disease. The fruit is also inclined to be soft and loses much of its keeping quality.

Eighty-year-old trees in Central Otago bearing good crops of fruit.

A deficiency of nitrogen causes the foliage to change to a yellowish green and may produce such symptoms as stunted growth, small leaves, poor fruit set, or early defoliation.

Nitrogen is very readily leached from the soil, and therefore should be applied in late winter or very early in spring, so that it is available to the tree 3 weeks before blossoming.

Nitrogen applied so that it becomes available to the tree only in the later part of the season tends to delay fruit maturity

Phosphates assist plant growth, particularly in the early stages, by stimulating root activity. They are also connected with fruit bud development and fruit maturity. A deficiency of phosphate causes poor root action and a dull green and bronzed appearance of the older leaves.

Potash improves plant fibre and builds up resistance to disease. It counteracts the effects of excess nitrogen and improves the colour and keeping quality of the fruit. Potash is essential for the production of carbohydrates such as starch and sugar. The foliage of trees starved of potash is dull green. Leaf scorch and early defoliation are further symptoms of a lack of this mineral.

Nitrogen, phosphorus, and potassium are all essential for the development and health of the tree and fruit; therefore a complete fertiliser which contains these three elements is much better than a manure which contains only one or even two of them.

Phosphates and potash are taken up by trees in greater portions during the early stages of development in spring. They also take some time before they become available to the trees, which makes it necessary to apply them before spring growth begins.

A number of fertilisers can be used to supply the three main elements required. Sulphate of ammonia, superphosphate mix, and sulphate of potash are those usually applied to orchard trees to furnish nitrogen, phosphoric acid, and potash. Blood and bone is also used to a great extent. The main point to consider in the purchase and use of fertilisers is the percentage of suitable plant constituents in them.

Quantities applied per tree must be varied, using the appearance of the individual tree as an indicator of its requirements, bearing in mind not only the crop to be matured in the current season, but also the encouragement of growth for provision of future fruiting wood. For some trees 4lb. would be sufficient, while others may require up to 12lb. to maintain them in good condition.

Liming: Lime supplies the element calcium which is necessary for tree growth. It improves the texture of heavy soils, thus making them easier to work, and reduces or neutralises soil acidity. The reduction of soil acidity encourages the growth of beneficial soil organisms. Most New Zealand soils are somewhat acid and lime can be applied with safety, but in Central Otago the position is reversed. Most of the orchard soils there are inclined to be alkaline or have an excess of lime. The addition of lime to an alkaline soil increases the alkalinity and also tends to make

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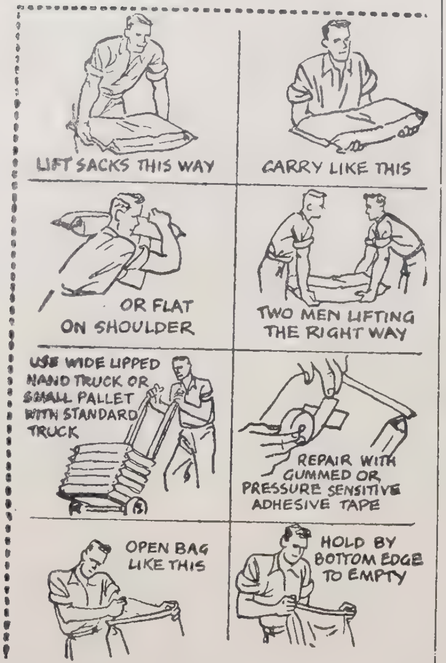
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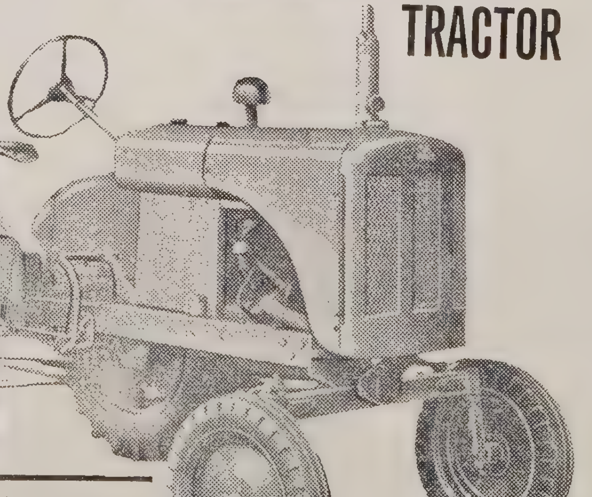
WINNER, Class 1 in the Royal Welsh Agricultural Society's Machinery Competitions, 6th June, 1951.



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other elements such as manganese, boron, and iron unavailable to the tree, thereby causing deficiency troubles.

In general, district practice for a particular soil type may be followed, and a great deal can be learned from a study of the results of past applications, but unless the soil is tested for acidity and calcium content, it is not possible to be definite on how much lime, if any, should be applied.

Frost Fighting

As the apricot tree is one of the first to blossom in spring, it is more subject to frost damage than other fruits. Because of this frost risk fire-pots have been installed in many orchards and frost fighting has become a recognised part of apricot culture, particularly in Central Otago. However, orchard management can assist to some extent in decreasing the first risk at this period, as experimental work has shown that over a clean cultivated soil there can be up to 5 degrees less frost than over one which is carrying a cover crop or weed growth.

Two types of fire-pots are in general use, both of them made of metal and consisting of three parts, container, "spider", and lid. The smaller pot holds 10 pints of fuel oil and burns from 2½ to 4 hours without refuelling. The burning time depends on whether the spider is taken off or left on. Spiders are taken off to increase heat only when the temperature continues to drop after all pots have been lit. The larger pot holds 21 pints of fuel oil and will burn for as long as 10 hours, which obviates the necessity for refuelling during the night.

Just before the danger period, which in an early season begins during late August, the pots are placed in the orchard in the centre of each row and filled in readiness for lighting. Usually one pot is required to each tree. Some growers place two small pots side by side to avoid refuelling during a burn, and the second pot is lit when the fuel in the first is almost exhausted.

The alarm thermometer which is used to warn the grower of a dangerous fall in temperature is placed in an open position in the orchard or close by the grower's residence. It is connected to batteries in the alarm box, thus forming a circuit, and when the temperature drops below a certain point the circuit is broken and the bell rings continuously inside the residence until it is switched off. The thermometer is set a degree or two higher than the danger point to enable the grower to collect staff and begin lighting the pots before damage occurs.

Other thermometers are placed in various positions throughout the orchard, usually one to about every 3 acres of trees, which allows the grower to check up on any variations in temperature. Sometimes variations of 2 to 3 degrees F. take place in very short distances, so that it is necessary to try to locate cold spots and place thermometers there. The thermometers are placed about 4ft. 6in. high under covers on posts in open positions. False temperatures will probably be recorded if they are placed in trees or in positions which are too sheltered. The delicate nature of these thermometers makes it essential that they are not breathed on or touched while being read, as this is likely to lead to a false reading.

Lighting should be started first where the temperature is lowest and on the side the air drift is coming from. Each pot in the outside row should be lit, but it is wise to light only alternate pots in every second row for a start. If the temperature still falls, the alternate pots in the rows which were left during the first lighting should be lit. By lighting only sufficient pots to keep the temperature above the danger point, fuel is saved, and if the frost is not a severe one but of long duration, the alternate full pots can then be lit when the first ones have burnt out, thus obviating the necessity of refuelling at night. Once burning has started it is necessary to make frequent rounds of the thermometers to check the temperatures.

The torches for lighting the fire-pots are filled with a mixture of equal parts of kerosene and benzine, and left in readiness. The wick and gauze in the spout should be examined and renewed if necessary, and the torch tested before it is required. On no account should a torch be used unless the gauze is in good condition and in place, as it is this part which prevents the lighting mixture in the torch exploding.

Frequently trouble is experienced in lighting new pots for the first time, but this can be overcome by adjusting the torch wick so that more lighting fluid runs out on to the fuel oil.

There are two main methods of refuelling the fire-pots. One method is with the use of a portable spray outfit with the pressure reduced to a few pounds per square inch. Too much pressure will cause the oil to overflow the sides of the pot before it is properly filled. The other method is with the use of a portable tank to which a hose is connected at the lowest point, and the oil is gravity-fed into the pot. A special filling gun is procurable for filling the pots by either of these methods.

To prevent possible damage to trees from fuel oil deposits spray tanks and pumps used should be thoroughly cleaned, preferably with a caustic solution, and then rinsed well with clean water before spraying fruit trees. When fire-pots are removed from the orchard after the frost danger period has ended they should be stacked on the headlands after the surplus oil has been emptied into convenient vats or drums for future use. Pots should not be up-ended and placed in the forks of trees, as the drainage from them has been known to kill trees.

The provisional list of temperatures dangerous to apricot production in Otago was compiled by the Fruit Research Station of the Department of Scientific and Industrial Research at Earnscleugh and was published for the guidance of growers. Experimental work on these lines is still proceeding.

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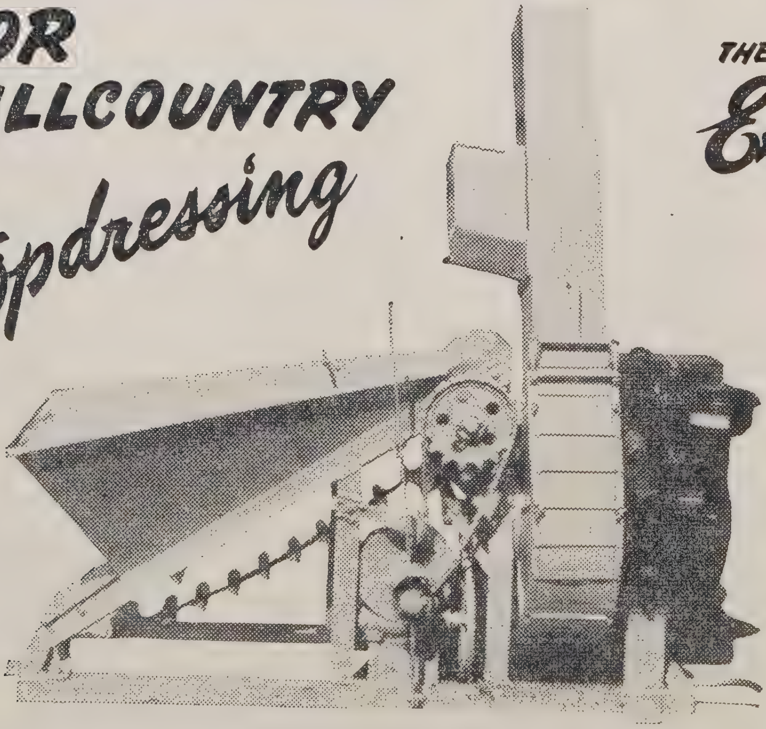

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PROVISIONAL LIST OF TEMPERATURES DANGEROUS TO APRICOTS IN OTAGO

Stage of growth	Temperatures (degrees F.) at which injury may occur if maintained 30 minutes or more	
	Moorpark	Roxburgh Red
Pink	23	
White tip	24	
Full bloom	27	28
Petal fall (stamens green)	28	29
Stamens withered ..	29	30
Burst calyx	30	30
Green fruit (.3in. to .5in. diameter) ..	30	30
Green fruit (.7in. to 1in. diameter) ..	29	29

Dry flowers or fruit may withstand the temperatures listed for considerably more than 30 minutes, but if the temperature falls 1 degree F. or more below the figures shown for any given stage of growth, extensive damage may occur in a short time. Ten to 15 minutes at 1 degree below the dangerous temperature is likely to cause a substantial loss.

When flowers or fruit are wet from rain, damaging points are approximately 1 degree F. higher than those shown. It appears that damage is far more extensive and is more rapid when the trees are wet. Dampness from light dew or fog does not seem to have the effect given by drops of water left by rain.

It is possible that temperatures higher than those listed might cause injury if continued long enough. Thus at the burst calyx stage 31 degrees F. maintained for several hours might cause damage. Experimental evidence is not yet available on this point, but it is not likely to arise often in practice, as temperatures fluctuate considerably during most frosty nights.

When comparing this list with field results it should be remembered that the temperatures quoted were recorded close to flowers or fruit, and not at 4ft. 6in. above ground level.

Varieties

Of the considerable number of varieties of apricots, only a few are grown to any extent in New Zealand. The main ones are as follows:—

Newcastle: The best early variety; fruit small to medium, roundish to slightly elongated; flesh orange yellow; pink blush on cheeks of exposed fruits.

Oullin's Early: Fruit medium to large, roundish, with flat top; flesh golden yellow; slightly pink cheek; inclined to be soft, and does not carry well.

Dundonald: Medium-sized fruit; rich golden yellow flesh which ripens from the inside; carries reasonably well; similar in shape to Roxburgh Red.

Roxburgh Red: Large elongated flattish fruit; golden flesh, red cheeked; good keeper and carries well; fruit is inclined to shed right up to maturity.

Early Moorpark: Similar to Moorpark but earlier.

Moorpark: The best dual-purpose apricot; fruit medium to large, roundish, slightly elongated, with deep yellow flesh; skin deep yellow with a red blush; keeps and carries well; a heavy bearer.

Bolton: Fruit medium to large, roundish, elongated; flesh orange yellow; a good carrier and heavy cropper, but fruit subject to cracking and brown rot.

Trevatt: A good dual-purpose apricot. Fruit medium to large, elongated, inclined to be flat; yellow fleshed; carries well; bears heavy crops.

Royal Late: Fruit small to medium; blushed cheek, deep yellow flesh; a good keeper and carries well.

The varieties have been listed in the approximate order in which the fruit reaches maturity. Harvesting dates have been omitted owing to variation from district to district. In general, harvesting is started during December and continues until late February.

Apricots are self-fertile and therefore do not require other varieties for cross-pollinating purposes.

Root Stocks

Apricots can be secured on three root stocks, apricot, plum, or peach. Those contemplating planting apricots should procure root stocks suitable for their particular soil type. For light well-drained soils, peach stocks may be successful. In a good loamy soil with adequate drainage, apricot stocks are better, though on the heavier soils or where the soil is inclined to be more retentive of moisture plum stocks may do better.

Planting

Land to be used for fruit trees should be put into the best possible condition long before it is planted. Any serious weeds such as couch grass or convolvulus should be eradicated, as once they get among the rooting system of a tree they are almost impossible to clean out.

Apricots in the main develop into large trees and do better if they have adequate space. In the past trees in many of the established orchards were planted too close to get the best return from them. Close planting hampers cultural operations, the trees have a tendency to grow higher, and only a small percentage of the crop is borne on the lower portions where it is easier and cheaper to thin and harvest. On good fertile land trees should be planted 20 to 24ft. apart both ways.

The best time of year to plant varies with the district and soil type. On light well-drained soils autumn planting is quite satisfactory, but on heavy soils or those inclined to retain moisture the trees should be left heeled in until spring. Autumn planting is not recommended for districts subject to very severe frosts.

A beneficial practice, common in Central Otago orchards, is to plant the young trees out in a nursery block for the first year. Usually when the trees arrive from the North Island or Australian nurseries the roots have been cut back very severely, and unless the trees receive the best of attention many are lost, particularly in a drought season. By placing them in a nursery for the first year, they generally receive much better attention, especially in regard to irrigation.

Marking out the positions for the trees should be completed over the whole area before the holes are dug. The pegs used for marking the exact positions of the trees have to be removed when the holes are dug, but by using a planting board and extra pegs, this difficulty may be overcome. The planting board is made from a piece of 1in. timber 4ft. 6in. long and 6in. wide by cutting V notches in both ends and in the centre of one side, the centre one being cut a little more than half-way through, about 3½in. deep. The board is placed so that the peg marking the tree position is in the centre notch, and pegs are placed in the end notches and driven securely into the ground. The board and centre peg are then removed, leaving ample room to dig the hole. Trees can then be correctly sited by replacing the board on the end pegs and placing the trunk in the centre notch.

In digging the hole, it is best to discard the subsoil and use good topsoil in the bottom. When the hole is finished it should be large enough to take the roots comfortably without cramping, the bottom being left dome shaped to facilitate root spread. Up to ½lb. of fertiliser mixed with the soil will assist the tree in getting a good start, but care should be taken that it does not come in direct contact with the roots. A mixture of 2 parts (by weight) of blood and bone to 1 part of serpentine superphosphate mix will be found satisfactory.

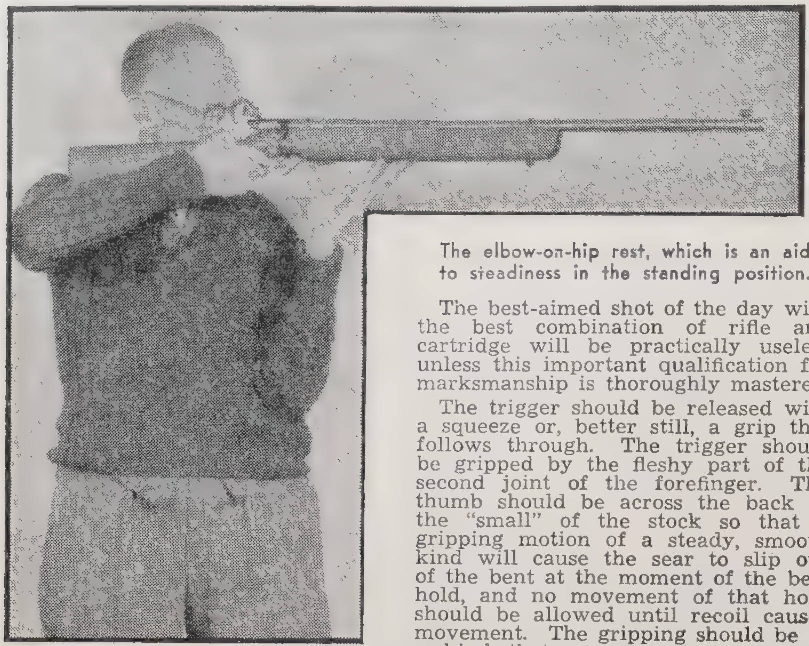
Young trees should be left in the nursery or heeled in until the holes are ready. Roots of young trees should be examined before trees are placed in their permanent positions and bruised or damaged portions pruned off. Very few trees have roots evenly spaced round them; usually most of the roots or the strongest of them are to one side. These stronger roots can be made to assist the tree to stand up to strong winds or help it if it is being planted on a hillside by placing them in the direction from which the prevailing wind comes, or, in the case of slopes, pointing uphill. The balance of the roots should be spaced as evenly as possible round the hole.

The tree should be planted as deep or a little deeper than it was in the nursery, but not to such a depth that the bud union is covered; the soil mark on the trunk will indicate the depth at which the tree was growing in the nursery.

In filling in holes use good topsoil from the sides of holes. When the roots are well covered give the tree a slight shaking up and down until the soil has worked in among them. At this stage the soil should be well firmed by treading. The last of the soil used for filling in should be left loose and a little above the usual ground level to allow for settling down.

It is unwise to prune the tops of young trees before planting, as the buds to which they are pruned may get damaged during handling and planting. This frequently spoils the shape of the tree.

Using Firearms Safely and Skilfully



The elbow-on-hip rest, which is an aid to steadiness in the standing position.

THIS article is the second of a series by G. G. Kelly, Arms and Ballistics Officer to the Police Department, dealing with the safe and skilful handling of firearms. Next month's article will describe types of sporting rifles and ammunition and the setting of sights accurately.

ONE of the most costly faults of rifle shooting is known as "trigger jerk", but it is easily overcome when it is recognised. It is costly because it is frequently not even suspected. The sequence of events is so rapid that the shot, noise, and recoil appear to be instantaneous with the release of the trigger, and the low percentage of successful shots may be blamed on the rifle itself or the ammunition.

The quickest way to detect trigger fault is by using the rifle without ammunition. This is called "dry practice" and the user himself should detect that his somewhat violent trigger jerk has disturbed the aim and that the foresight has moved away from where he was sighting it.

This fault must be eliminated before even a fair average of well-placed shots can be expected. The pupil is helped considerably if a teacher or coach stands to one side and watches the muzzle closely. Any experienced marksman by doing this can not only detect the pupil's trigger jerk, but can also gauge where the bullet would have gone had a cartridge been fired.

With rim-fire ammunition it would be well to use a fired shell in the breech to absorb the blows of the firing pin. With some rifles it is possible to damage the cartridge seating of the barrel unless this is done. This damage may cause misfires later on.

Too much emphasis cannot be placed on this point of proper release of the sear by the movement of the trigger.

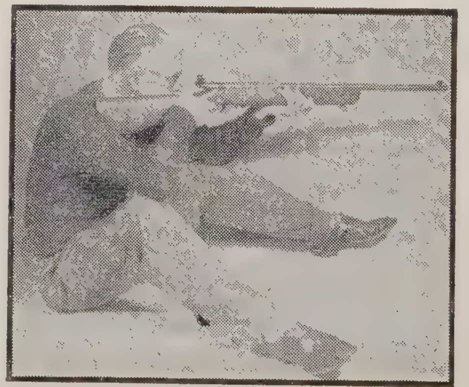
The best-aimed shot of the day with the best combination of rifle and cartridge will be practically useless unless this important qualification for marksmanship is thoroughly mastered.

The trigger should be released with a squeeze or, better still, a grip that follows through. The trigger should be gripped by the fleshy part of the second joint of the forefinger. The thumb should be across the back of the "small" of the stock so that a gripping motion of a steady, smooth kind will cause the sear to slip out of the bent at the moment of the best hold, and no movement of that hold should be allowed until recoil causes movement. The gripping should be of a kind that one uses to squeeze a lemon. The same care that is taken in this operation to prevent the lemon juice from squirting should be used in directing the bullet.

The Standing Position

Many game animals have to be aimed at from the standing position, which is the most difficult of all positions, as there is no steadying factor to assist the marksman. There is a satisfactory method that can be used and one that is quite easily learnt once the underlying principles are understood. It is known as the "swinging shot" and is used by pistol champions all over the world.

Rules of pistol shooting require that a competitor stands with the weapon in one hand and the arm extended. There is no support possible. He may not use his left hand to steady his shooting arm or hand. How then do pistol marksmen get such extraordinary scores? The answer appears to lie in the ability to get the shot away at the correct moment when the sights are swinging from right to left or vice versa, whichever way the competitor chooses, and he probably uses only one way. This moment is when the sights are just passing under the bullseye and it is then that he finishes the "pull" or release of the shot.



The sitting position for shooting. A comfortable hold can be obtained by sitting on the ground with the knees drawn up so that the elbows rest securely on them.

A rifleman can get his shot away much more easily on the same principle. The stance is as relaxed as possible and the rifle is merely held comfortably firmly. Part of the load on the trigger is applied and the final pressure should finish the movement at the right moment. The man who braces himself rigidly and tries to steady the rifle by main force will fail, because this attitude brings only unsteadiness and flinching, as any good golfer knows.

Holding a heavy rifle is easier than holding a light one, because the heavier weapon helps to absorb or reduce vibration. However, in the .22 calibre nearly all the heavy rifles are designed for indoor rifle shooting and are expensive. They also have the drawback of being less convenient to carry around the farm.

Elbow-on-hip Rest

One other aid can be used for the standing shot when using a .22 rifle. This is sometimes allowed in rifle competitions in America and Continental countries where "off-hand" practices are followed. The rifleman's left elbow is rested on the top of his left hip bone and the rifle is balanced on the very tips of the fingers of the left hand. This gives an "elevation" rest to the rifle that is impossible in any other method. The rifle will still swing from side to side, but the up and down movements will be more easily controlled.

The pose necessary for this elbow-on-hip rest is not readily adopted and requires a little practice. The illustration above shows that the body is side on to the target so that the hip bone is brought straight below the fore-end of the rifle. This allows the forearm to be a straight prop between these two points. The length of the fingers is needed to make the hold useful.

The Continental rifleman uses a round ball which is attached to the fore-end of the rifle by a 4 or 5in. connecting rod. This ball, which is about the size of a cricket ball, rests on the inner heel of the palm and the fingers close round it. This fitting is a mere refinement and would be an added burden to the farmer; the finger rest will work quite as well for all ordinary game shots.

Advantage should always be taken of available natural rests such as a small tree if there is no wind blowing or a stump or fence post. Every natural advantage should be used to prevent wastage of ammunition.

Uses for Aluminium Foil

ALUMINIUM foil, a commodity frequently mentioned in overseas publications, has just come on to the New Zealand market. It is not likely to be very cheap or very plentiful, but it has uses in the kitchen, six of which are given by Norma K. Metson, Rural Sociologist, Department of Agriculture, Wellington.

IN appearance the foil is like a sturdy "silver paper", and is sold in rolls with a cutting device so that the required amount can be removed easily. It is moisture proof, greaseproof, and is not penetrated by air or odours. With careful handling it may be smoothed out, rinsed if necessary, and re-used a number of times.

Possible uses for aluminium foil in the kitchen would be:—

Wrapping food which is to be kept airtight and fresh, such as cakes or biscuits which are to be posted, sandwiches which have been made before they are needed, or vegetables prepared in advance.

Wrapping meat or fish for storage in a refrigerator or for covering containers to prevent drying out and the spread of odours in a refrigerator.

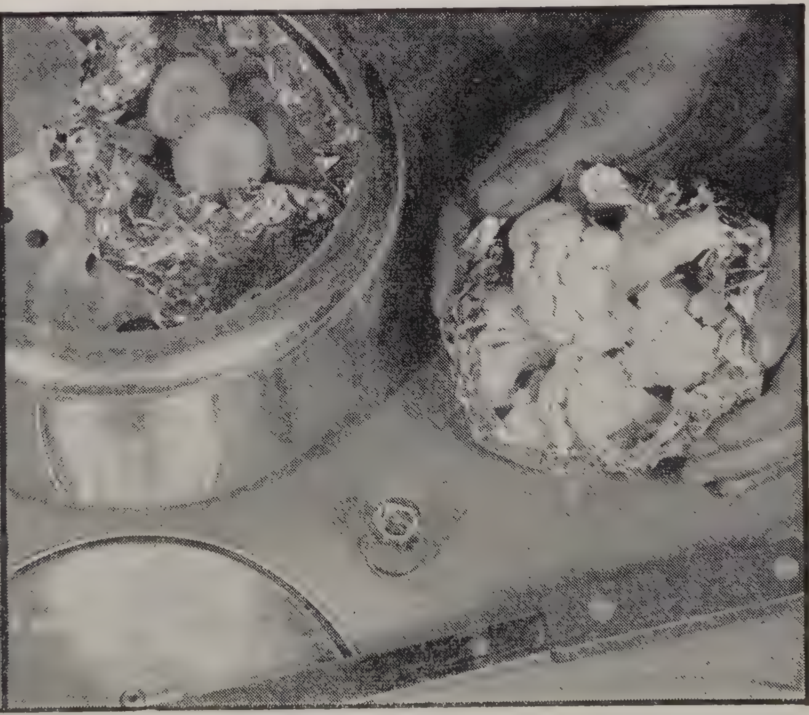
Covering pudding basins.

Making cup-like containers when individual puddings or small quantities of vegetables are to be cooked separately in a pressure saucepan or in the oven.

Covering the top of food which is browning too rapidly in the oven.

When the foil has become too torn and crumpled for other uses it makes a good lining for a cake tin when fruit cake is being cooked, as it helps to distribute the heat evenly and prevents the cake from sticking or burning on the bottom.

Aluminium foil used to wrap sandwiches.



Aluminium foil as a covering for a pudding basin (left) and as a separation for vegetables in a pressure cooker (right).

Feijoas Have a Variety of Culinary Uses

By NELL MACPHERSON, Rural Sociologist, Department of Agriculture, Auckland

ONE of the most popular sub-tropical fruits is the feijoa. It ripens in February, March, and April and the fruits, which are egg shaped and bluish green, should be allowed to drop from the trees, as they are not ripe until then. The flesh of ripe feijoas is soft and is light gold in colour. Under-ripe fruit has a flavour reminiscent of turpentine. Feijoas may be used raw as a dessert, in salad and in fruit salads, or they may be cooked in a variety of ways. Some of their uses are described in this article.

AS the flesh of feijoas discolours rapidly when it is exposed to the air, peeled fruit can be kept light golden by being put into water to which a little salt, vinegar, or lemon juice has been added.

Feijoa Salad

6 ripe feijoas
2 tablespoons of chopped walnuts
4 tablespoons of mayonnaise
Lettuce leaves

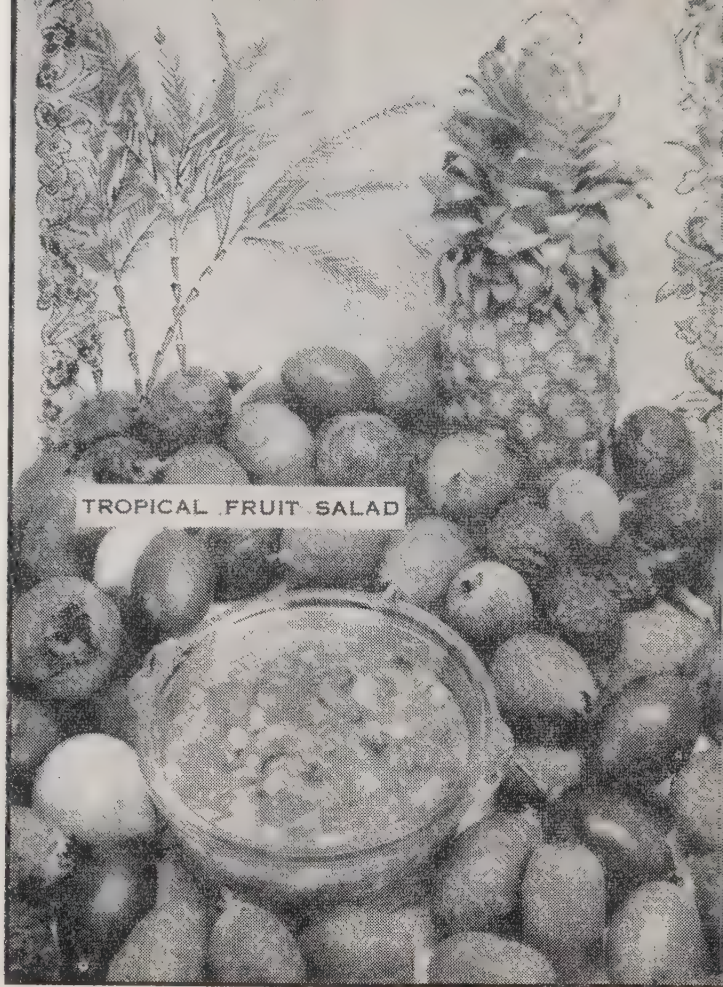
Peel and slice the feijoas. Add the chopped walnuts and the mayonnaise and mix them lightly with a fork. Pile spoonfuls of the mixture into crisp lettuce leaves. Garnish with grated cheese or a small dab of vegetable extract.

Tropical Fruit Salad

Feijoas, tree tomatoes, Chinese gooseberries, passion fruit, persimmons, and pineapple may be used for tropical fruit salad, the proportion of the fruits being adjusted according to taste.

If fresh pineapple is used, it should be peeled and cubed and stewed in a light syrup of honey.

Remove the hairs from the Chinese gooseberries by rubbing them in a coarse cloth. Peel the feijoas, tree tomatoes, Chinese gooseberries, and persimmons and slice them. Scoop the pulp from the passion fruit. Mix the fruits in the syrup from the pineapple and add the pineapple cubes. A little lemon juice may be added to sharpen the flavours.



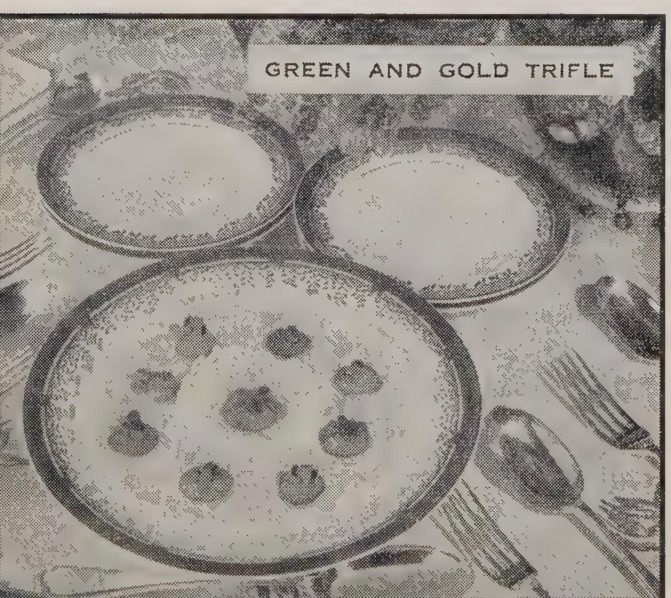
TROPICAL FRUIT SALAD

Green and Gold Trifle

Sponge cake
1 pint of boiled custard
3 tablespoons of raspberry jam
9 feijoas
Whipped cream

Slice the sponge and place it in the bottom of a bowl. Pour enough boiling water over it to soften it.

Remove the blossom ends of the feijoas and set them aside to use as a garnish. Peel and slice the feijoas. Spread 1 tablespoon of the jam over the softened sponge. Cover it with a layer of feijoa slices and then a layer of custard. Add the remainder of the jam, sliced feijoas, and custard in layers, finishing with a layer of custard. Allow the trifle to set slightly; then arrange the blossom ends of the feijoas in a pattern on the custard. Pipe it with the whipped cream. (8 servings.)



GREEN AND GOLD TRIFLE

Stewed Feijoas

Prepare a syrup with ½ cup of sugar and 1 cup of water. Peel and quarter 6 feijoas and place them in the syrup. Simmer them till they are tender. (Feijoas are stewed in syrup to retain their shape.)

Feijoa Crumble

12 feijoas sliced and stewed
Crumble topping:
½ cup of flour
½ cup of wholemeal
½ cup of butter
1 teacup of brown sugar
1 teaspoon of baking powder
Pinch of salt

To make the crumble topping mix all the dry ingredients and rub in the butter until the mixture has the texture of fine breadcrumbs. Place the hot stewed feijoas in a baking dish and sprinkle the crumble topping over them. Bake in a moderate oven until the crumble is crisp and brown (375 degrees for 1 to 1½ hours). Six to 8 servings.

Feijoa Pudding

2oz. of suet
1 cup of flour
1 teaspoon of baking powder
6 feijoas, peeled and quartered
Pinch of salt
Milk to mix

Rub the suet into the dry ingredients. Add sufficient milk to make a stiff dough. Cut off ¼ of the dough. Roll the remainder out to ¼in. thickness and line a greased pudding basin with it. Put the quartered feijoas into it and sprinkle with sugar to taste. Roll the remaining dough into a circle large enough to fit the top of the basin. Place it over the fruit and pinch the dough together at the edges. Cover the top of the basin with greaseproof paper. Place it in boiling water and cook it for 1 to 1½ hours. Turn the pudding out on a plate and serve with custard sauce. (6 to 8 servings.)

Feijoa Pie

2 cups of flour
1 cup of fat
Pinch of salt
Water to mix
Peeled and sliced feijoas
Sugar

Cut the fat into the flour and salt and add sufficient water to make a stiffish dough. Divide the pastry in halves. Roll half of it out and line a pie plate with it. Sprinkle a little sugar on the pastry; then add the feijoa slices and sprinkle a little sugar over them. Roll out the remainder of the pastry and cover the fruit with it. Pinch the edges of the pastry together. Cut two slits in the top of the pastry for steam vents and decorate the pie with the pastry trimmings. Bake at 375 degrees for ¾ hour.

Feijoas can be treated like apples in making one-crust pies and sponges for puddings or in making fruit roly-poly.

Feijoa Betty

2 cups of stewed feijoas
1 cup of juice from the stewed feijoas
1½ cups of soft breadcrumbs
1 teaspoon of ground cinnamon
1 teaspoon of grated lemon rind

Combine all the ingredients, put them into a greased baking dish, and put a few dabs of honey over the surface and bake at 375 degrees for ½ to ¾ hour. Serve with custard sauce or the thickened juice from the stewed fruit. (6 servings.)

Feijoa Flan

Make a pastry shell by covering the outside of a sandwich tin with short pastry and baking it. For the filling use 1 packet of jelly crystals and 4 feijoas.

Peel, slice, and stew the feijoas. Drain off the juice and mix the jelly with it. Place the feijoas in a sandwich tin and cover them with the jelly. Allow the jelly to set and then unmould it into the pastry shell. Garnish with whipped cream. (A red or green jelly is very attractive.)

Feijoa Fritters

6 feijoas
Batter:
4oz. of flour
1 tablespoon of sugar
Pinch of salt
1 egg
1 cup of milk

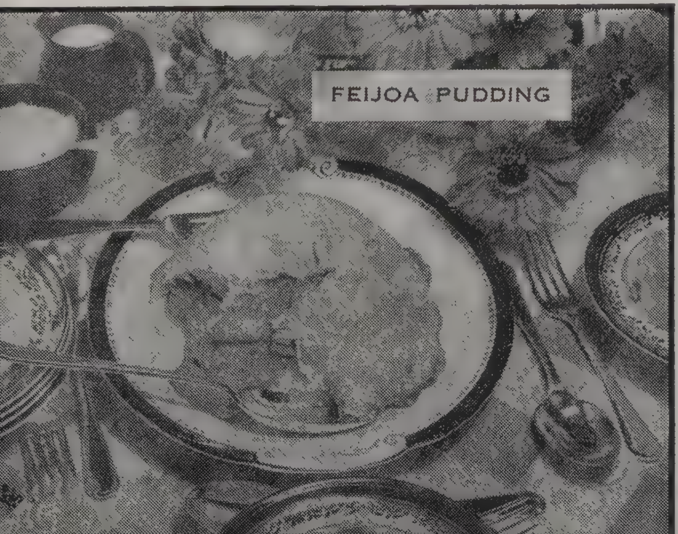
Sift the dry ingredients and make a well in the middle of them. Drop the egg and 2 tablespoons of milk in the well and mix smoothly. Add the rest of the milk gradually and beat the batter well. Allow to stand for at least an hour. Peel and slice the feijoas and drop them in the batter. Fry them in shallow fat until golden brown on both sides. Drain them on crumpled paper and serve with a dusting of icing sugar. (4 to 6 servings.)

Feijoa Jam

2lb. of peeled sliced feijoas
2lb. of sugar
Grated rind and juice of 1 lemon
¼ pint of water

Grease the bottom of the jam pan to prevent it from sticking. Put the fruit and water in the pan and slowly bring them to the boil. Simmer the fruit until it is tender. Add the lemon juice and rind and the warmed sugar. Bring to the boil and boil hard for 10 minutes. Test it for setting. Continue to boil it hard until the jam is ready to set. Allow it to cool slightly and pour into hot sterilised jars. Seal the jars.

Feijoas can also be combined with rhubarb or apples to make jam; the same proportion of 1lb. of sugar to 1lb. of fruit should be used.


FEIJOA PUDDING

FEIJOA FRITTERS

Preserved Feijoas

First Recipe

Choose ripe, well-shaped fruits. Make a syrup of 1 cup of sugar and 2 cups of water. Peel the feijoas and cut them in halves crosswise or in quarters lengthwise. Place them in a bowl of water to which 1 teaspoon of salt to the pint has been added. When all the fruits are prepared take them out of the salted water and blot them dry with a clean cloth. Pack them into jars and cover with the syrup, using a knife to remove air bubbles from the sides of the jars.

Fill the jars to within ½in. of the top.

Seal the jars according to the directions given with the lids or seals and set the jars on a rack in a container of water with the water at least 1½in. over the tops of the jars. Bring the water slowly to the boil and boil for 20 minutes. Take out the jars and allow them to cool undisturbed for 24 hours. Test the seals when the jars are quite cold.

Second Recipe

Prepare a syrup of 1 cup of sugar to 2 cups of water and add the peeled and sliced feijoas to it. Bring to the boil and boil gently for 20 minutes. Pack into hot sterilised jars and fill to ½in. from the top. Wipe the tops of the jars and adjust the seals according to the type of lid used. Leave to cool undisturbed for 24 hours. Test the seals.

Feijoa Chutney

First Recipe

3lb. of feijoas
½ cup of curry powder
1lb. of sultanas
½lb. of salt
2lb. of brown sugar
2 quarts of vinegar
1oz. of cloves
2oz. of sliced crystallised ginger

Peel and chop the feijoas and add the other ingredients. Bring them to the boil and boil them hard for ½ to ¾ hour until the feijoas are soft. Pour them into hot sterilised jars and allow them to cool. Seal them with paraffin wax and cover them.

Second Recipe

2lb. of feijoas
1lb. of raisins
1lb. of dates
2lb. of onions
1lb. of brown sugar
1 quart of vinegar
1 teaspoon of ground cloves
1 tablespoon of curry powder
1oz. of ground ginger
1 teaspoon of cayenne
4oz. of salt

Cut off the blossom ends of the feijoas and peel the onions. Mince the feijoas, raisins, dates, and onions. Add the dry ingredients and lastly the vinegar. Bring to the boil, stirring constantly to mix well. Boil for 2 hours. Pour into sterilised jars and allow them to cool. Seal them with paraffin wax and cover them.

Feijoa Relish

1 dozen feijoas
2 medium-sized apples
2 medium-sized onions
½ pint of vinegar
½oz. of mixed spices
1 tablespoon of salt
1lb. of sugar
1 teaspoon of cayenne

Peel and slice the feijoas, apples, and onions and cover them with the vinegar. Bring them to the boil and boil slowly for ½ hour. Add the remaining ingredients and cook them until the feijoas, apples, and onions blend. Pour into sterilised jars and allow to cool. Seal them with paraffin wax and cover them.

Photographs by Sparrow Industrial Pictures Ltd.

Materials and Measurements for Single Bedspreads

Style	36in. material	48in. material	54in. material
Throw-over	1— 106in. long x 71in. wide 6yds. of material ½in. seam allowance 1in. top and bottom hems Selvedge on sides No waste	4— 130in. long x 80in. wide 7½yds. of material ½in. seam allowance 2in. top and bottom hems 1in. side hems Waste: Two strips 135in. x 6½in.	7— Not economical unless lengthwise grain of material runs across width of bed 106in. x 80in. 4⅔yds. of material ½in. seam allowance 2in. side hems ½in. top and bottom hems No waste
Gathered or pleated	2— 124in. long x 70in. wide 8¼yds. of material ½in. seam allowance 1in. top hem Selvedge on other edges No waste	5— 129in. long x 81in. wide 8¼yds. of material ½in. seam allowance 1in. top, side, and bottom hems Waste: 108in. x 11in.	8— 127½in. long x 81in. wide 8¼yds. of material ½in. seam allowance 2in. top hem 4½in. side and bottom hems Waste: 108in. x 17in., 48in. x 27in.
Corner pleated	3— 124in. long x 70in. wide 7yds. of material ½in. seam allowance 1in. top hem Selvedge on other edges No waste	6a— 129in. long x 81in. wide 7⅔yds. of material ½in. seam allowance 1in. top, side, and bottom hems Waste: 108in. x 11in., 48in. x 24in.	9a— 127½in. long x 81in. wide 7⅔yds. of material ½in. seam allowance 4½in. side and bottom hems 2in. top hem Concealed join in end pleat Waste: 108in. x 17in.
		6b— 129in. long x 81in. wide 7yds. of material ½in. seam allowance 1in. top, side, and bottom hems Join in middle of end skirt Waste: 108in. x 11in.	9b— 127½in. long x 81in. wide 7yds. of material ½in. seam allowance 4½in. side and bottom hems 2in. top hem Join in middle of end skirt Waste: 108in. x 17in.

Sewing Details for Each Style and Width of Material

1—There is a seam down the centre of the bedspread.

2—The top cover requires 3yds. of material. The remainder of the material is cut into halves lengthwise and joined into one long strip for the side skirts, which are gathered or pleated along the two sides and bottom end of the top cover.

3—The top cover requires 3yds. of material. The remainder of the material is cut into halves lengthwise and joined with a flat seam to make one length. The middle seam of the length is placed in the centre of the bottom end of the top cover. Allow 18in. for each complete corner pleat. The top cover and the sides are sewn together.

4—Cut the material into two lengths measuring 3¾yds. (135in.). From each of these pieces cut a strip 135in. x 6½in. Sew the raw edges of the remainder together so that the bedspread measures 135in. x 82in.

5—Cut off 3yds. of material for the top cover. From this cut off waste material so that the top cover measures 37in. wide. Cut the remaining 5¼yds. of material into halves lengthwise and join them into one long strip for the side and end skirts, which are gathered or pleated along two sides and one end of the top cover.

6a—Cut off 3yds. of material for the top cover. Cut this length to measure 108in. x 37in. Cut the remaining 4 2/3yds. of the material into halves lengthwise—that is, into two strips each 168in. long—and join them into one long strip for the side and end skirts. Join the skirt to the top cover along one side and allow 18in. for the inverted pleat at the corner; continue attaching the skirt to the top cover and allow 18in. for the second inverted pleat. The join in the skirt is concealed in the second corner pleat. Complete the joining of the skirt to the top cover.

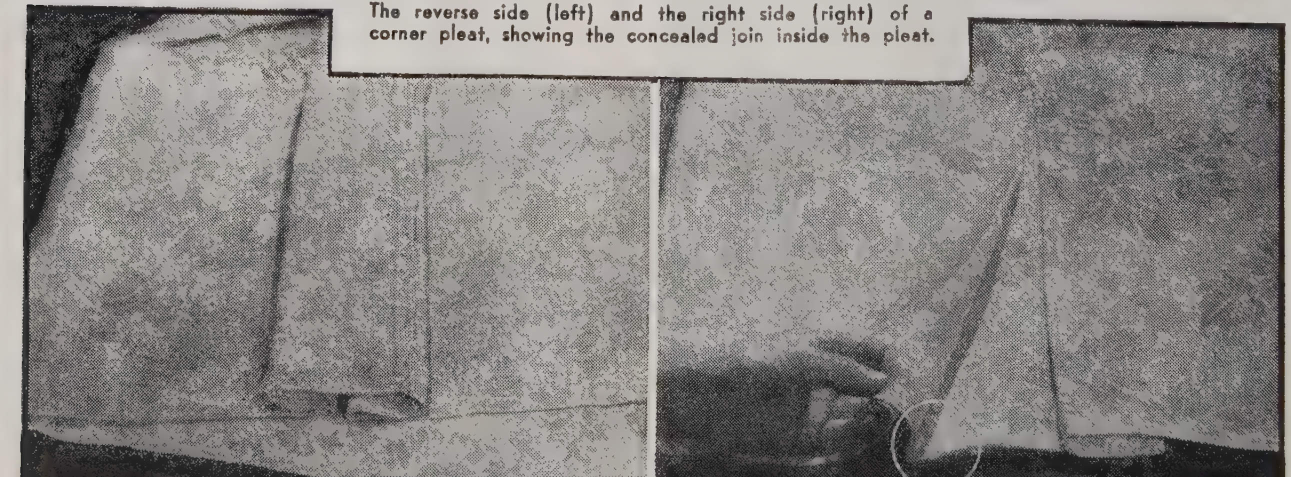
6b—Cut off 3yds. of material for the top cover. Cut this length to measure 108in. x 37in. Cut the remaining 4yds. of the material into halves lengthwise—that is, into two strips 144in. long—and join them into one long strip for the side and end skirts. Join the skirt to the top cover, allowing 18in. for each inverted pleat at the bottom corners. The join in the skirt will be in the middle of the end skirt.

7—Cut the material into two pieces each 7ft. long. This bedspread is suitable only for a bed with a foot board, as it is only 106in. long.

8—Cut off 3yds. of material for the top cover and cut it to measure 108in. x 37in. Cut the remaining 5¼yds. of material into halves lengthwise for side and end skirts and join the two pieces to form one strip 27in. wide, which is gathered or pleated and attached to the top cover.

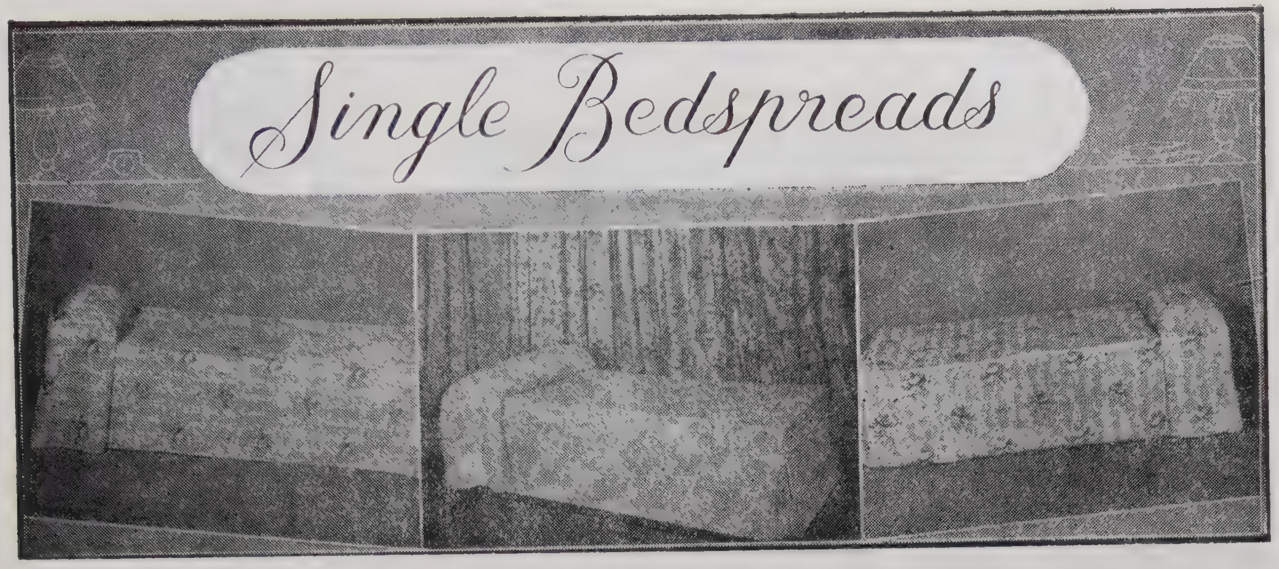
9a—Cut off 3yds. of material for the top cover and cut this length to measure 108in. x 37in. Cut the remaining 4 2/3yds. of material into halves lengthwise—that is, into two strips 168in. long—and join them into one long strip for the side and end skirts. Join the skirt to the top cover along one side and allow 18in. for the inverted pleat at the corner; continue attaching the skirt to the top cover and allow 18in. for the second inverted pleat. The join in the skirt is concealed in the second corner pleat. Complete the joining of the skirt to the top cover.

9b—Cut off 3yds. of material for the top cover and cut this length to measure 108in. x 37in. Cut the remaining 4yds. of material into halves lengthwise—that is, into two strips 144in. long—and join them into one long strip for the side and end skirts. Join the skirt to the top cover, allowing 18in. for each inverted pleat at the bottom corners. The join in the skirt is in the middle of the end skirt.



The reverse side (left) and the right side (right) of a corner pleat, showing the concealed join inside the pleat.

Single Bedspreads



NEW BEDSPREADS can add prettiness and brightness to a bedroom. Little sewing experience is needed, and great enjoyment can be obtained from the choosing of styles and materials and the achievement of something worth while. In this article Molly Macpherson, Rural Sociologist, Department of Agriculture, Auckland, describes the making of single bedspreads; double bedspreads will be dealt with in an article in next month's "Journal".

ALL cotton and linen materials and some rayons wash well, and the heavier is the cotton material the less it creases. Less creasing is likely with material that has a novelty weave.

Materials suitable for bedspreads are obtainable in plain colours, floral, striped, checked, or conventional patterns, plain weaves, or material with a woven pattern. Choice depends on the type of room or furnishings and the limit of expenditure. Furnishing materials are 48 or 54in. wide, though some 36in. dress fabrics may be quite suitable.

Styles can be varied and the pattern of the material may run lengthwise or crosswise, as in the illustration above. Basically a bedspread requires a straight piece of material to cover the area of the top of the mattress and a skirt to cover the sides. The side skirts may be gathered, pleated, or hung straight with an inverted pleat at each corner at the foot of the bed for fitting and appearance. The "throw-over" style, which requires no fitting but is draped over the made-up bed, consists of straight lengths of material sewn together. A bed with a foot board may need only enough material to be tucked in under the foot of the mattress and not a longer or floor-length end skirt.

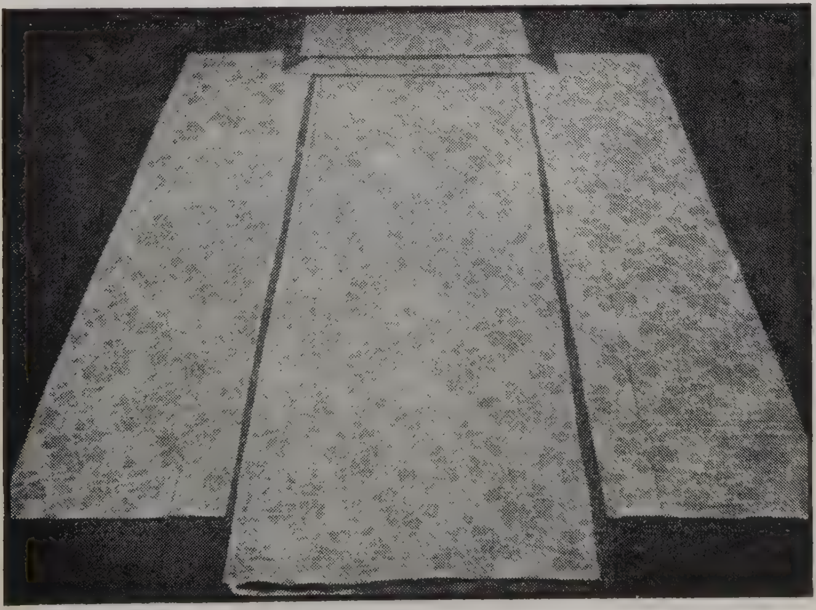
Detailed on the opposite page are dimensions and sewing directions for various sizes of bedspreads and materials. The lengthwise grain of the material runs along the length of the bed unless otherwise stated.

The pleated or gathered style requires the measured length plus half as much again for fullness in the side and end skirts. For the corner-pleat style sufficient material has been allowed for each half of the inverted pleat to be 4½in. deep, so that when the bedspread is turned inside out the corner pleat appears to be a box pleat measuring 9in.

Piping made from contrasting material or from the waste material may be inserted in the seams around the top cover. Piping may be made by covering piping cord or thick string with strips of the material. For the covering of piping cord and sewing of seams with piping inserted a piping or cording foot must be used on the sewing machine. Strips of material used to cover piping cord are usually on the bias of the material, but for a bedspread the straight of the material may be used, as the seams are long and straight and there are only two corners to turn with the piping.

Though the sewing technique is more difficult, a more attractive finish is gained by cutting a piece as wide as the depth of the mattress from the top of the side skirt and rejoining it with piped seams, as in the centre example in the heading illustration.

The lower illustration on this page shows how patterns for two bedspreads can be worked together so that, with the double length of the material to be cut from, long strips the depth of the mattress for the tops of the side skirts may be cut to eliminate some of the joins which occur in cutting from the shorter length of material bought for only one bedspread. If two bedspreads are being cut from the same material, the pattern can be laid out so that the long narrow strips of material for the tops of the side skirts can be cut in one piece.

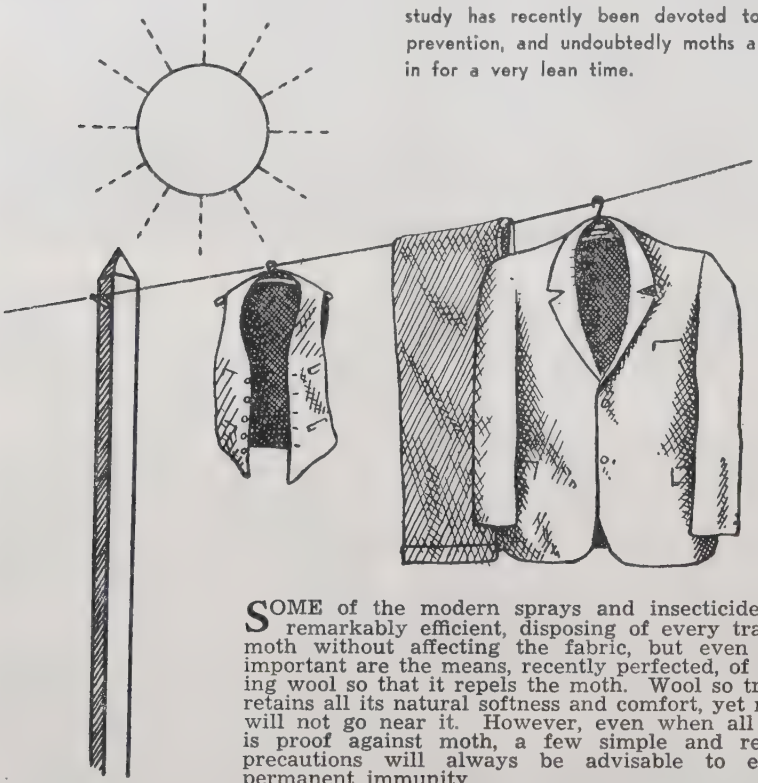


Cut-out pieces for a single bedspread.

Photographs by Sparrow Industrial Pictures.

Protecting Wool Materials from Damage by Moths

MOTHS like the natural wool fibre so much that they eat it, and most people are only too well aware of the damage these prolific pests can cause if left to their own devices. Fortunately, much research and study has recently been devoted to moth prevention, and undoubtedly moths are now in for a very lean time.



SOME of the modern sprays and insecticides are remarkably efficient, disposing of every trace of moth without affecting the fabric, but even more important are the means, recently perfected, of treating wool so that it repels the moth. Wool so treated retains all its natural softness and comfort, yet moths will not go near it. However, even when all wool is proof against moth, a few simple and regular precautions will always be advisable to ensure permanent immunity.

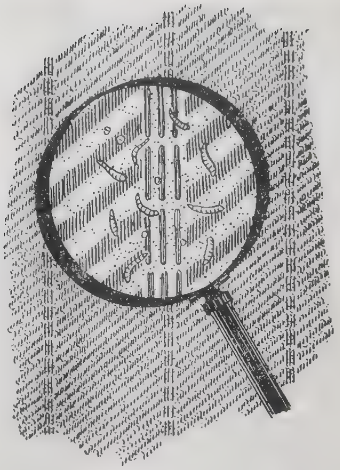
Grubs do the Damage

Most people know that it is the moth grub and not the moth they see flitting about that does all the damage. Autumn is the danger period, for that is when moths lay the eggs from which the grubs hatch out. The eggs themselves are often very difficult to detect, each being no bigger than a pinhead, and they are usually in the darkest and dustiest places. The secret of moth prevention is to clear away the eggs before they can turn into grubs.

Wool likes fresh air and moths do not but like to be left quietly undisturbed in the dark, so hanging clothes out in the sun now and then is a very good idea. Wool thrives on such treatment, for the fresh air revives the fibres. Clothes should be brushed well and shaken gently, and at the same time a careful inspection should be made underneath seams, folds, cuffs, turn-ups, and other likely places for sign of moth eggs.

Protecting Upholstery

Moths attack upholstery in an underhand manner, more often than not eating their way through from the back. Therefore the important treatment for upholstery is a regular brushing, beating, and pummelling, paying special attention to the undersides of chairs and cushions, the grooves round the seats, and all out-of-the-way places. Curtains, too, should be brushed regularly to prevent moths settling down. As well as preventing moth damage, a little regular treatment such as this keeps wool upholstery and curtains looking their best.



Care of Carpets

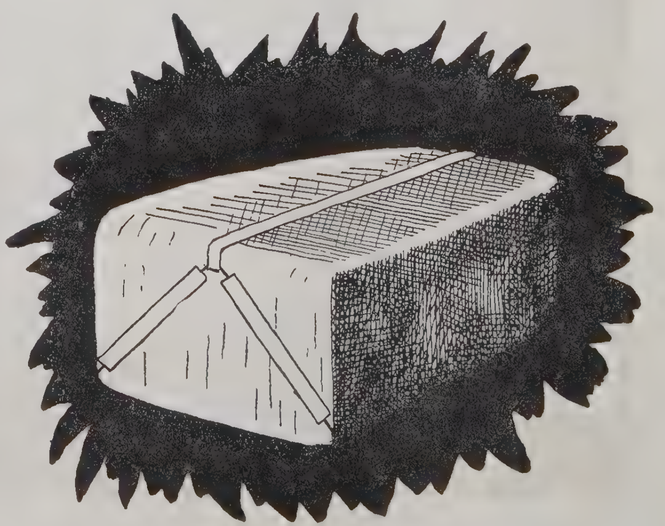
A carpet provides nice cosy quarters for moths, and the most obvious place in a closely fitting carpet is round the edge where it hugs the wall. Dust and fluff gather there and should be brushed out regularly, particularly in autumn, when the eggs are laid. Another refuge for moths is where the carpet goes under furniture.

Storage Precautions

Before any woollen material is stored it should be spotlessly clean, as dirt attracts moths. If articles are being put away for any time, a newspaper parcel should be made of them, moth crystals sprinkled inside, and the parcel sealed with gummed paper.

As an extra precaution, cupboard shelves may be scrubbed with disinfectant, particular attention being paid to all corners and crevices. The floor of the wardrobe or cupboard should be kept free from dust and fluff and the door shut tightly.

Moths are especially fond of fur, so if possible furs should be kept on their own and given special care.



Successional Planting in the Flower Borders

THE PRECEPT "give young plants ample room in which to develop" should be borne in mind by the gardener who desires a satisfactory succession of blooms. Attention to the points made in this article for the flower gardener by the Horticulture Division will enable successional plantings to be made successfully, avoid wastage and loss of young plants, and ensure that the border makes a continuous display and that plenty of young plants are always coming into flower in the border as the old ones fade.

IF CERTAIN basic principles are followed, the flower border in the home garden can be made much more colourful and effective. The need of never missing a sowing or planting date cannot be over-stressed, but there is certain to be a period when the borders are out of flowers and dull if planting a new batch of plants is delayed until the borders look shabby. Successional planting is needed to keep flower borders continuously bright.

Importance of Light to Young Plants

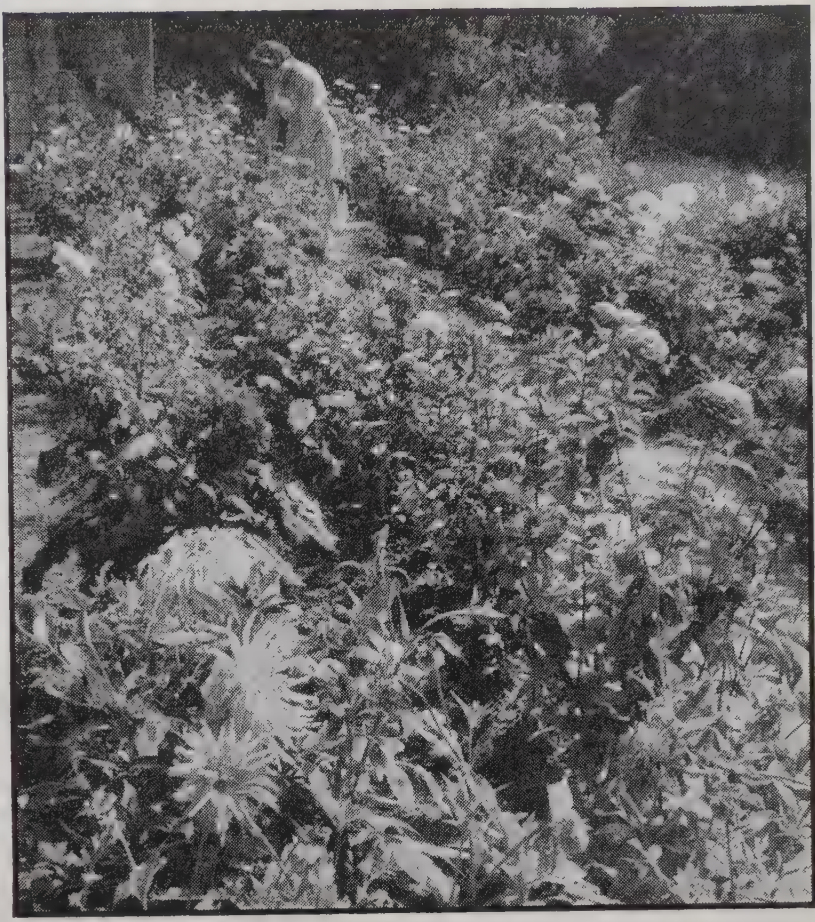
However, successional planting does not mean merely setting out young plants between the old ones; it is not quite as easy as that, because most plants need moisture at their roots and light for their leaves in order to grow. Some plants, such as the ferns, can grow where there is relatively little light, but nearly all the plants which are grown in the flower border need direct sunshine on their leaves for at least part of the day if they are to thrive. Leaves that are shaded from the direct rays of the sun turn pale green or yellow (etiolated), often become thin and weakly, and can neither do their work of manufacturing sugars and starches for the plant nor resist the attacks of diseases.

In Nature, and especially in the New Zealand bush, many plants are able to exist in shady places on the forest floor when young and send out stems which struggle up into the light among the tree tops. Once their heads are in the light these plants thrive and develop to maturity.

Unfortunately, most garden flowers have none of this ability. Unless they have light from their early, seedling stages they become spindly and weak and often die. Even those which may survive and ultimately grow through neighbouring plants into the light are usually short lived and incapable of producing a worthwhile display of flowers.

Water Equally Important

A constant supply of moisture to the roots is just as important to young plants as the supply of light. Plants cannot grow without enough moisture, lack of water first causing growth to cease and then leaves and stems to wilt. Plants can recover from a certain degree of wilting, but there comes a point when wilting is so severe that the tissues cannot recover and the plant dies.



[Sparrow Industrial Pictures Ltd. photo.

As the plant's water supply is all taken up from the soil by its young roots, a well-developed root system is needed to reach out and use the available water in the soil. A plant with small or mutilated roots is ill equipped to grow in a dry soil where a plant with longer, deeper, and more numerous roots probably could grow quite well.

Thus young plants set out among older ones will be poorly equipped to use such water as the soil may still contain, especially if they are planted in summer and autumn, when the soil moisture has been drawn on heavily by plants already in the border. For that reason it is important to water plants in and, if the soil is dry when they are planted, to continue to water them until they have developed good root systems.

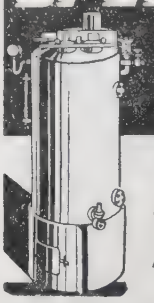
Successful Successional Planting

There are thus two reasons why young plants "just popped in" between older ones are often a total loss, disappearing from sight and mind as they are overshadowed by their more strongly growing neighbours, which rob their leaves of light and their roots of moisture. No wonder there is little left of the young plants, on which much care may have been lavished, when the overgrown old plants are finally pulled out.

To establish new plants successfully in a flowering border it is always worth while to raise and grow them elsewhere to fairly large size so that they are well enough developed when planted to compete with neighbours for light and soil moisture. That emphasises the advantage of raising successions of plants in boxes and pots for planting out in the border.

Alternatively, if seeds are sown or small seedlings planted out in the border, they must be put only in fairly extensive gaps where they will not be overshadowed by the tops or robbed of moisture by the roots of established neighbours. Coupled with this replanting policy should be ruthless tearing out of old annuals when they have passed their peak, and perennials such as marguerites and hybrid wallflowers should be cut back hard, even though they still have quite a number of flowers, to leave room for the proper development of the new plants.

SPEEDWAY



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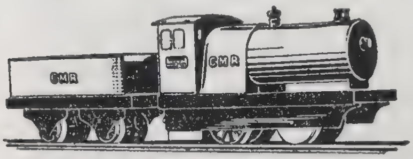

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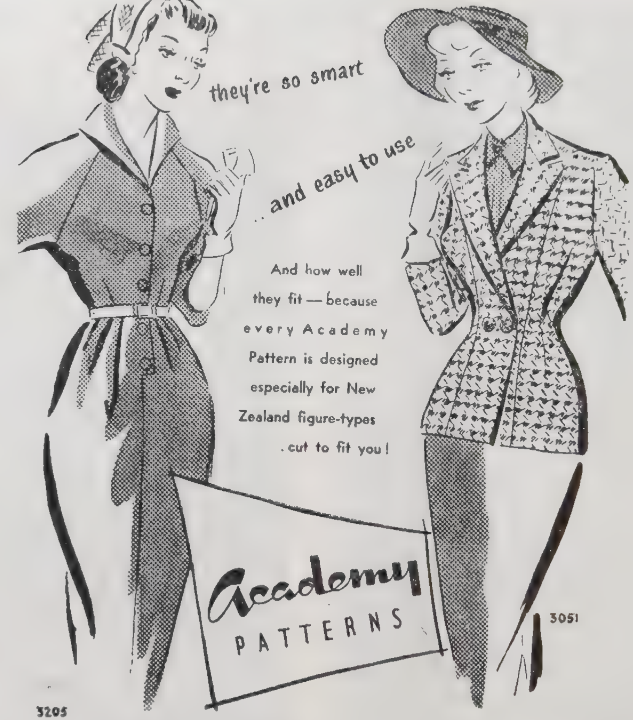

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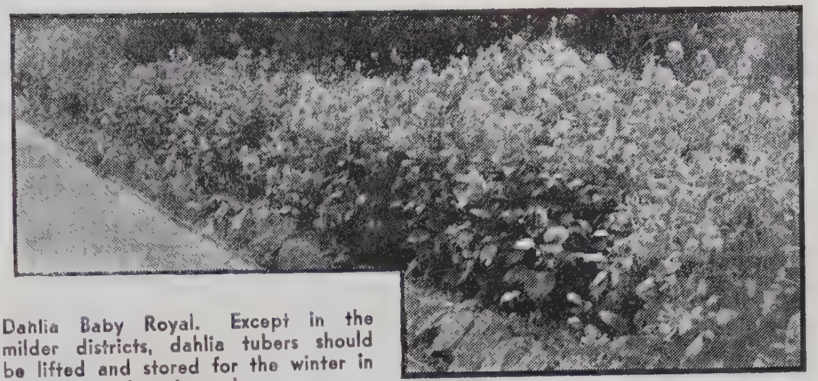


Dahlia Baby Royal. Except in the milder districts, dahlia tubers should be lifted and stored for the winter in a frost-free place.

Annuals sown earlier for spring flowering should be thinned to an inch or two apart as soon as they can be handled. Further thinning is necessary as the plants become larger, until they are finally thinned to 8 or 9in. apart by the time they are in flower. Annuals that have been raised in boxes from seed, or self-sown seedlings lifted from the borders, can still be planted out in vacant spaces in the borders in very mild districts, but elsewhere these seedlings are probably better not planted out until the end of winter.

Cinerarias should be inspected from time to time. The "woolly-bear" caterpillars that can devestate cinerarias later in the season can usually be kept down by hand picking at this time, but spraying with D.D.T. in spring and early summer is well worth while.

Chrysanthemums are usually left in the border from year to year in the milder districts, but where sharp frosts are experienced it is safer to lift the stools in autumn, label them, and plant them in a cold frame for the winter. Little water or attention need be given them through the winter, but these plants will provide a good supply of cuttings when they are required for propagation later.

Cuttings will form new roots only if a continuous supply of soil air reaches the cut surfaces, where the new roots will appear. Success with cuttings depends on, among other things, the texture of the soil in which they are put to root. Silty soils, such as those in many New Zealand gardens, run together when watered and form a crust when they dry. The more often they are watered the tighter this crust becomes and the more difficult it is for air to pass through it. Cuttings in a pot, box, or frame must be damped down often until they root, and they root badly in a silty soil because the supply of air to their roots is insufficient. Now is the time, when the cold frame is more or less empty, to make sure that the texture of the soil in it is suitable for propagation. A liberal addition of coarse, gritty sand will do much to open the texture of the soil, prevent it from caking when watered, and so ensure a good supply of air to the bases of cuttings to be propagated next season.

Dahlias left in the ground from the previous year produce the earliest blooms, but they cannot be left outdoors safely in districts where winters are hard. Except in the mildest districts, the roots are better lifted, dried off, and stored for the winter in a place where they will be protected from frost. They do not require a warm place, temperatures between 35 and 40 degrees F. being satisfactory. In relatively mild districts the roots can be kept beneath an evergreen hedge if shed storage is not available. In mild districts where dahlia roots are customarily left in the ground through winter it is advisable to lift them in late winter at least every 3 years and divide the old roots or replant single tubers taken from the outside of the old clumps, making sure that each tuber has at least one bud on its neck.

Dead flower heads should be removed regularly even in winter if the borders are to be kept in flower for as long as possible. They should always be cut off with a knife or scissors or pinched off with the thumb nail, and never pulled off, as pulling is likely to wrench the roots and may even result in some of the annuals being pulled out of the ground.

Deep digging does more than anything else to encourage the large, deep root systems which are necessary if plants are to grow well. Plants with shallow roots are sensitive to dry conditions when the surface soil dries out, whereas deep soils remain moist for much longer and roots can draw a constant supply of moisture from the deeper layers. The mixed border gives less opportunity for deep digging than does the vegetable garden, but every opportunity should be taken of digging the borders, even though only small areas can be dug at a time. Digging in autumn is especially beneficial, as rain soaks more readily into soil that has been broken up; much badly needed moisture runs off the surface instead of soaking into the soil if the flower border is left with a hard surface through winter. All hard surfaces should now be pricked lightly with a fork even if the ground is occupied and cannot be dug over. The aim should be never to let the ground become hard, but to loosen the surface whenever it shows signs of caking to make sure that rain can soak in instead of running off.

Herbaceous plants in the borders should continue to be lifted, divided, and replanted after the digging and manuring of the site.

Planting time for most trees, shrubs, and herbaceous plants extends from about May to early October. Advantages of autumn planting are that the soil is still relatively warm after summer and plants usually form new roots quickly. The cool, moist conditions of winter are least trying to newly planted stock, but winter storms are likely to rock shrubs and trees planted in autumn, as they will not have had time to produce new anchorage roots, and a very wet spell in winter will often kill newly planted stock outright if the soil is poorly drained and becomes waterlogged. Spring planting is less likely to result in trouble from waterlogging by heavy winter rains, but the plants will have less time in which to form deep root systems before the arrival of hot, dry summer weather. Spring planting is best if the soil tends to be wet in winter.

Cinerarias, which make a fine display in a semi-shaded position, should be inspected from time to time for "woolly-bear" caterpillers, which can do a great deal of damage by eating the leaves.

[*Photo News Ltd. photo.*

Sweet peas are among the finest of annuals for New Zealand conditions and provide attractive displays of cut flowers. For best results they should be given as long a growing season as possible, and seed may be sown in May in the earlier districts.

Pot plants should be trained as bushy specimens and not be allowed to become leggy. Young fuchsias, balsams, and geraniums potted up as rooted cuttings to flower next year should be pinched several times as they grow to cause them to produce well-branched plants. Pinching means the removal of the tip of a shoot while it is still soft enough to be pinched off between the finger and thumb nail.

Sweet peas should be given as long a growing season as possible. In early districts where the site will be ready for planting by July or August seeds should be sown in May in pots or boxes in a cold frame. They should be given quite hardy conditions and need the protection of the frame light only in really cold weather. Seeds are sown 1½in. apart and 1in. deep.

Pests and Diseases

Eelworm often affects chrysanthemum plants, resulting in the leaves drying prematurely and shrivelling. This pest can be controlled properly only by hot-water treatment of the stools in winter and planting them in sterilised soil. Cuttings from plants treated in this way will be free from eelworm and, if planted in soil not infested with eelworms, will grow into healthy plants retaining all their leaves to the ground.

Mildew on a variety of ornamental garden plants can best be controlled by a sulphur fungicide. The most effective method is to use a liquid spray such as lime sulphur, colloidal sulphur, or, best of all, a combination of the two, but the use of sulphur sprays is limited seriously in the flower garden by the fact that all these liquids discolour paint work and cannot be used safely near the house. A fairly satisfactory method of combating all the common mildew diseases on flowering plants is to use sulphur in the form of a dust—either flowers of sulphur or a proprietary sulphur dust. Dusts are not as efficient as liquid sprays, but are reasonably effective if applied very uniformly, preferably in the early morning when the plants are still damp with dew. One method of application is to put the dust in a piece of cheese-cloth, tie the bundle to a stick, and shake the stick or tap it with another to drive off a small cloud of the dust. However, that is a wasteful method, and every home gardener will find a hand duster a good investment.

Spotted wilt virus disease of tomatoes is carried over from one year to the next on a variety of plants, especially dahlias, lettuces, Iceland poppies, and nasturtiums. Dahlia roots marked earlier as virus infected, and any of the plants named which show spots on the leaves or are stunted, malformed, or in any way abnormal, should be dug out and burnt. Rigorous killing of infected plants that are carrying over the disease from year to year gives some hope of reducing losses in next season's tomatoes.

"Shih Chin" or "Ten Best Parts"—A Special Chinese Dish

TWO very special Chinese dishes are made from titbits of ten different vegetables or meats, carefully cooked and seasoned. In China the "ten best parts" ("shih chin") would include some of the rarest Chinese delicacies; the following recipes have been simplified to include only ingredients obtainable in New Zealand:—

Ten Best Parts—Vegetable

1 small cauliflower
2 or 3 pieces of celery
1 cabbage heart or 2 or 3 sprouts
2oz. of shelled broad beans
2oz. of celeriac
2oz. of bamboo shoots (if obtainable)
2 or 3 sticks of asparagus
½lb. of mushrooms
2 or 3 spring onions
2 tablespoons of green peas
2 tablespoons of stock
3oz. of butter, dripping, or lard
1 tablespoon of soya-bean sauce or a teaspoon of meat or vegetable extract dissolved in hot water
½ teaspoon of ve tsin (aromatic flavouring which can be omitted)
Salt
Cornflour to thicken

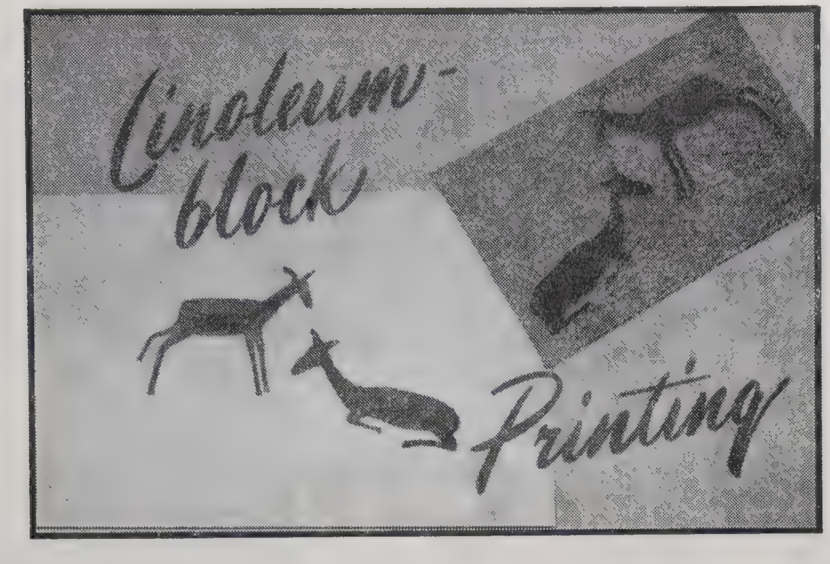
Chop all the vegetables fairly finely. Heat the fat in a heavy pan and fry the cauliflower, celery, beans, and celeriac for 5 minutes, stirring them all the time. Add the rest of the vegetables, the soya-bean sauce, and salt to taste and cook the mixture for 5 more minutes. Add the stock and the ve tsin, and when the mixture is boiling thicken it with a little cornflour mixed with cold water. Cook it for another minute or two and serve it with steamed rice.

Ten Best Parts—Meat

1 chicken liver
2oz. of ham
2oz. of cod
1 leg of chicken, cooked
2oz. of fresh shrimps
1oz. of fresh lobster, crayfish, or crab
1 tablespoon of green peas
2 spring onions
2oz. of mushrooms
1 slice of green ginger root
3oz. of butter, lard, or dripping
1 tablespoon of soya-bean sauce
2 tablespoons of stock
Salt
Cornflour

Chop all the ingredients fairly finely. Heat the fat and fry the liver, ham, and cod for 4 to 5 minutes. Add the rest of the ingredients and fry them for another 5 minutes. Thicken the mixture with cornflour and cook it for another 2 minutes. Serve it with steamed rice and more vegetables.

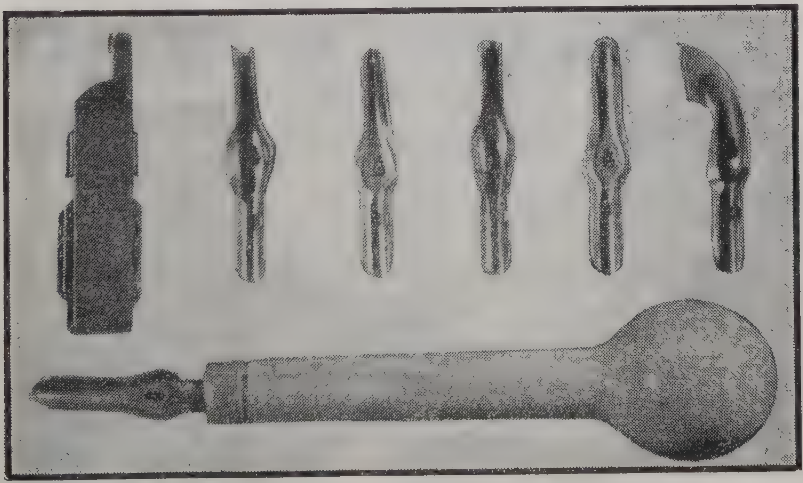
—*DOROTHY JOHNSON,*
formerly Rural Sociologist,
Department of Agriculture,
Christchurch



BLOCK PRINTING is a very old process. It has been used for centuries for printing wallpapers and for decorating fabrics, as well as for pictorial representation. Of all the crafts it is one of the simplest to practise in the home. Only a few small tools are used and very little space is needed compared with that required for crafts like pottery or weaving. Elementary principles of designing and printing from a linoleum block are described by Helen Paine, Rural Sociologist, Department of Agriculture, Wellington.

ORIGINALLY wooden blocks were used for printing, but linoleum is much easier to cut and handle. The finest lines and clearest-cut designs can still be produced with a wooden block, but linoleum is a better material for the beginner to use. It can be the ordinary household variety; a piece left over from the kitchen flooring would do, but ideally it should be of good quality, smooth surfaced, at least ⅛in. thick, and preferably in one colour without a pattern so that a design can easily be marked on it. Any wax on the linoleum should be removed with a scouring powder. If the dimensions required are marked on the back and a cut made through the canvas and just into the linoleum, it will snap along the cut line and come apart cleanly.

The process consists of drawing a design on paper and transferring it to the linoleum block, which is gouged away so that the lines and masses which are to be printed stand out in relief. The block is then inked and applied to the material to be printed. Tools for this work can be bought as a printing set, but expense can be saved by improvising many of them from pieces of household equipment.



A set of tools used for making linoleum blocks. From left—A tool for removing cutters from the handle; a small V-shaped tool for cutting fine lines; a large V-shaped tool for cutting outlines; a shallow U-shaped tool for straightening edges; a U-shaped gouge for cutting out large areas; and a blade for cutting straight lines. At the bottom is the handle with a cutter fitted into it.

Choosing a Design

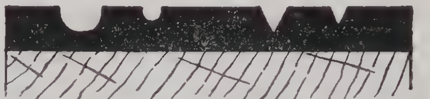
Almost any subject can be printed from a linoleum block, abstract designs and motives being especially suitable. The beginner would be wise to attempt simple line drawings and silhouettes at first.

The design, after being planned and inked, is traced on to fine tracing paper, which is pinned on to the linoleum face downward to reverse the design—particularly important if the design includes lettering. A piece of carbon paper is placed shiny side down between tracing and linoleum, and the lines are drawn over with a sharp, hard pencil. The tracing on the linoleum is checked with the original design and any discrepancies are drawn in.

Inking in the portions of the linoleum that are not to be removed helps to avoid mistakes in cutting and gives the worker an idea of the effect that will be obtained in the print.

Equipment Required

The five tools for cutting the linoleum are all designed for different kinds of work—the large V for cutting outlines, the small V for cutting fine lines, the large U for gouging out large areas, and the small U for cleaning out areas and tidying lines. A sharp knife is needed for straight cuts.



End sections of cuts made by U-shaped and V-shaped tools.

This set of tools can be improvised with little trouble. Razor blades, penknives, chisels, and paring knives are all useful. Old pen nibs and the ribs of discarded umbrellas make excellent gouges. The ribs, which are in two sizes on each umbrella, may be filed off and sharpened into U or V shapes; if possible, they should be sharpened to the shape of the cutter with a whetstone and fitted into a handle of wooden dowelling. All the tools used for cutting the linoleum must be kept well sharpened so that the lines cut are of uniform depth and have clean edges. Blunt tools are difficult to control and often slip in the hand, ruining the cut.

Cutting the Design

The tool is held in the palm of the hand with the first finger near the cutting edge to steady and guide it when gouging out deep cuts and large areas. For cutting fine lines the tool is held like a pencil. Cutting away from the body gives best control of the tools, but the linoleum must be firmly held in position. Two blocks of wood nailed at right angles to a third and larger piece will hold it in position.

The many different treatments of a linoleum-block design are variations in the type of cut-out.

Silhouette: The design is left solid to print and the background cut away.

All-over pattern: The subject is cut away and the design appears white on a solid background.

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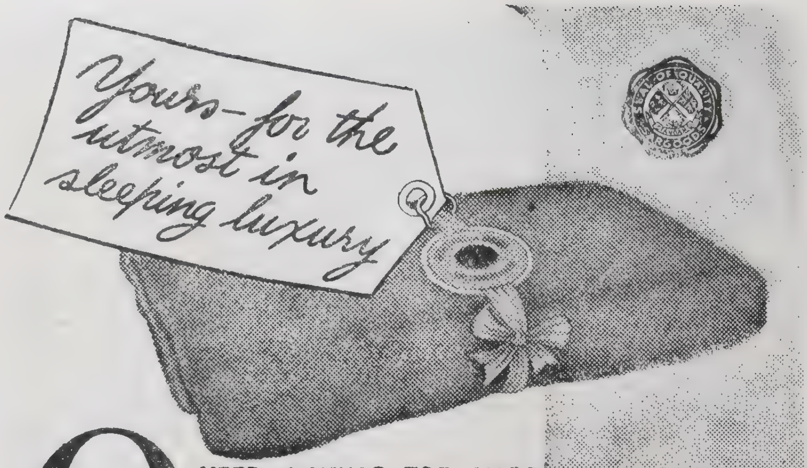

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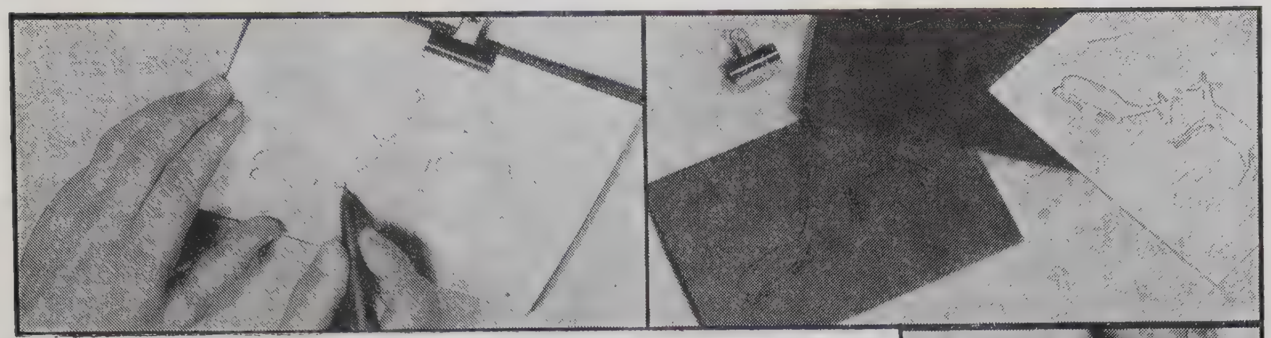


Above left—The reversed design is traced on to the block. Above right—The design has been transferred to the linoleum through the carbon paper. Lower right—The design is inked, the outline cut, and the uninked linoleum cut away.

White-line drawing: The subject is cut out in fine lines, making a fine drawing on a dark background.

Black-line drawing: Cutting away everything except the outline of the subject produces a line drawing on a white background.

A design can be varied by different treatments of the dark portions. Cutting fine lines or gouging small dots on to the solid surface varies the texture.

First step in cutting the block is to outline the design with the large V-shaped tool. Small areas around the lines are cut away with the small U-shaped gouge, then the big areas that are left are gouged out with the large U-shaped tool. The small V-shaped tool is used only for the finest lines.

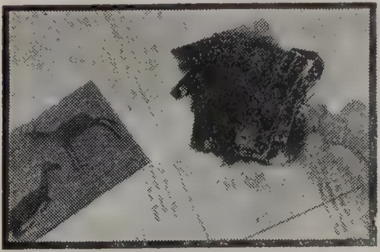
The linoleum should be removed to a little more than half its depth. The block is weakened if the linoleum is cut away to the burlap backing.

At this stage taking a proof off the block (a process described in the next section) enables corrections to be made. Sometimes lines need gouging more deeply and edges straightening.

When the cut has been corrected and improved the linoleum can be glued firmly to a wooden block of the same size with carpenters' glue or linoleum glue. When the glue has been left to dry for at least 24 hours overlapping edges of linoleum are trimmed off with a sharp knife or chisel.

The Printing Process

The block is coated with ink, which adheres only to the pieces that are left uncut. The printing paper is placed on the block and pressure is exerted on it so that an ink impression of the design remains on the paper when it is lifted. The block can then be inked again and the process repeated.



Ink is spread on a glass slide with a roller, which is then passed over the block.

The ink can be either printers' ink, which is soluble in kerosene, or water-soluble linoleum ink; both are available in a variety of colours. The ink is applied to the block by a roller (included in most block-printing sets), or a dabber can be made from a stocking darner padded with cotton-wool and covered with chamois or suede leather. Applying the ink with a paint brush gives an attractive lined effect, and a stippled effect is achieved when it is applied with a sponge. The ink is spread out on a glass or metal slab, thinned if necessary, and spread with a spatula and then with the roller; only enough ink is used to give the slab an even coating. The roller should be run up and down and across the slide and then up and down and across the linoleum block to ensure even distribution of ink. The printing paper must be placed on the block in exactly the right place.

At this stage there are several ways of taking the print off. One is to place a wooden slab on top of the printing paper and hammer it evenly all over before removing slab and paper carefully. Another method is to cover the printing paper with two or three layers of thick cardboard and roll the surface with a rolling pin.

If the linoleum has not been mounted on a wooden block, prints can be taken by putting it through a clothes wringer. The tension is first loosened to allow both linoleum and paper to pass through it easily. This is a good way of taking off a proof of the cut, and it is a satisfactory method of printing many copies if care is taken.

After being printed the paper should be spread out until the ink is dry.

Colour Printing

To print in more than one colour a separate block is needed for each colour. The design must be traced accurately on to the same number of blocks as there are colours in the design. The design must be fairly simple with the regions of colour well defined. With the original at hand, all the portions of the design that are one colour are inked in on the first block and the background cut away as before. The process is repeated for each colour, the blocks all being made exactly the same size so that the designs do not overlap in the printing.

The printing paper should be secured so that it cannot slip and the position at which the blocks are laid down should be marked. Each block is rolled with coloured ink as for one-colour printing. Starting with the lightest, each colour is printed on the paper and allowed to dry before the next colour is applied until the complete picture is built up. Three colours, such as yellow, red, and black, are printed in that order so that any overlapping shows as little as possible. Additional effects can be achieved by reversing this order, but these techniques are mostly acquired with practice and by experiment. Yellow on top of red, for instance, can achieve a gold-like glint.

Each colour must be dried thoroughly before the next can be printed, so the best technique after the initial experiment is to print as many as possible of one colour at a time.

Uses for Linoleum Blocks

Apart from the interest that linoleum-block printing provides as a creative art, this craft has many uses in the household. For example, it enables the printing of individual Christmas cards. Calendars and bookmarks are attractive and personal presents when they have been printed by the giver.

A book-plate may be cut in linoleum, mounted on a block, and kept to stamp in all books; if organising the printing outfit every time a book needs its owner's signature is too much trouble, a large number may be printed at one time and stuck into books as they are required.

An attractive frieze for a child's room can be made by printing simple animal cut-outs on to a plain wallpaper. Small place cards for a children's party can be made attractive if they are decorated with brightly coloured linoleum-block prints.

Many other ideas will come to mind as skill in this craft increases.

Working Plan of Preparations for a Party Dance for 80 Guests

The Week Before

Arrange for the crockery and equipment that is to be borrowed or hired.

Arrange transport for all the goods to the hall.

Make out a shopping list after planning the menu and listing the quantities required.

Buy such things as toothpicks, paper serviettes, decorations, and prizes if needed for the entertainment.

Set aside the preserved fruit for the fruit salad.

Iron table linen.

Set aside wood and paper for the fire or copper in the hall if required.

List and if possible pack into a box such things as tea, vases, dishcloths, soap, teatowels, two jugs, prizes for competitions, muslin bags for holding tea leaves, and trays for serving the tea or coffee.

On the day of the party dance such items as milk, extra oven slides, flowers, and all the food will be packed for transport to the hall.

Three Days Before

Make the cheese straws, sponge lilies and angels, savoury puff cases, and jam tarts.

This baking may be stored in air-tight tins until the day of the party dance.

Two Days Before

Kill and clean 8 fowls.

One Day Before

Mix the fruit salad, except for the bananas.
Prepare the trifles, except for the whipped cream.
Cook the fowls.
Prepare the sandwich and savoury fillings.
Set the jellies.
Prepare the mayonnaise and coffee essence.
Mix and roll the pastry ready for baking.
Make the butterfly cakes and 4 sponges.

The Day of the Party Dance

Cut the flowers in the early morning and arrange the flowers and decorations.

Make the sausage rolls, small pies, and pastry cases.

Boil 20 eggs and prepare the savoury eggs.

Prepare the hors d'oeuvres and place them on oranges or other fruits.

Unmould the jellies.

Make the sandwiches and asparagus rolls.

Wash the lettuce.

Cut the fowls or crayfish into pieces and place them in lettuce leaves.

Prepare the garnishes.

A Few Hours Before

Put whipped cream on and decorate the trifles and sponges.

Put whipped cream in the small cakes.

Slice the bananas into the fruit salad.

Place all the crockery and cutlery for serving.

Place all the food, with the possible exception of the hot savouries, on plates for serving.

Begin heating the water for tea or the milk for coffee.

Menu for a Buffet Supper

Chicken in lettuce: 1 fowl per 10 guests; or

Crayfish in lettuce: 3lb. of crayfish in the shell per 10 guests.

Sandwiches: 1½ per guest.

Savoury eggs: 1 egg per 4 guests.

Hot savouries: 2 per guest.

Other savouries: 2¼ per guest.

Small cakes: 1 per guest.

Sponges: 1 per 20 guests.

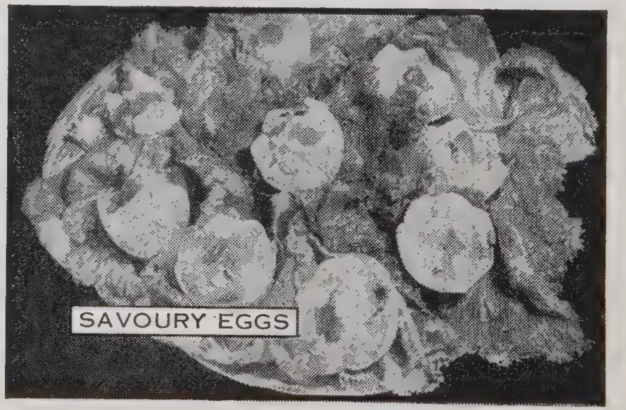
Fruit salad: 4 fl. oz. per guest.

Trifle: 1lb. of trifle sponge per 15 guests.

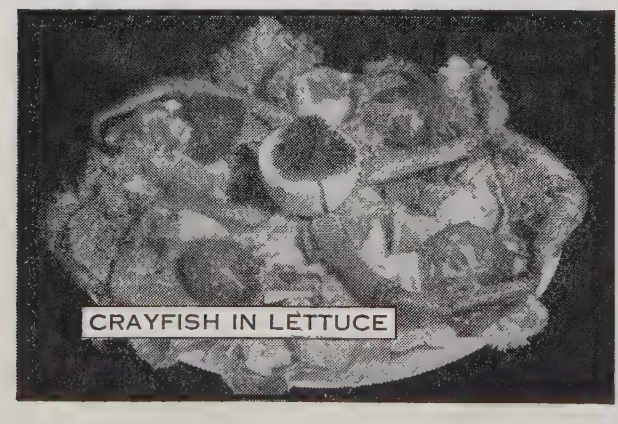
Jellies, savoury or sweet: 1 pint per 20 guests. Jelly serves more as a decoration to the table than as an item on the menu.

Tea: 1lb. of tea and 1 gallon of milk per 100 guests; or

Coffee: ¾lb. of coffee and 4 gallons of milk per 100 guests.



SAVOURY EGGS



CRAYFISH IN LETTUCE

Quantities of Food for 80 Guests

Fowls: 8 of average size; or

Crayfish: 8, each 3lb. in the shell.

Lettuces: 12 of medium size.

Bread: 1½ 4lb. sandwich loaves.

Butter: 1½lb.

Savouries: 13 dozen pastry savouries, and 16 dozen other savouries.

Cakes: 7 dozen small cakes, 4 sponges, and 6lb. of trifle sponge.

Eggs: 20 for savoury eggs.

Milk: 2 quarts for custards.

Cream: 2 quarts for whipping.

Fruit: 10 30oz. tins of fruit or the equivalent and 2 small bottles of passion fruit pulp; 3lb. of bananas may be substituted for 1 tin of fruit.

Tea: 1lb. of tea and 3 quarts of milk; or

Coffee: ¾lb. of coffee and 3 gallons of milk.

Catering for a Party Dance

CATERING for a large number of people on a festive occasion is not difficult if the details of the evening are well organised. This article by Molly Macpherson, Rural Sociologist, Department of Agriculture, Auckland, shows how, with planned arrangements and preparations, the hostess can have a successful evening at which she can enjoy the entertainment and provide her guests with a home-made supper that will delight the eye and please the palate.

WHEN a party dance is being organised decisions to be made include how many guests are to be invited, whether the entertainment will take place in the home or a public hall, the form of entertainment, and provision for music and perhaps for a photographer.

All the details of planning, the crockery and linen requirements, the cooking needed, and the working plan for the preparations can be noted in a note-book. For a party dance to be held in a hall and attended by, say, 80 guests such things as trestles for the supper table, linen, crockery and cutlery, heating facilities, table accessories, and decorations need to be noted. Simple floral decorations are most effective, but if they are placed on the tables holding the food, the vases should be high enough to raise the flowers well above the level of the food.

It may be possible to borrow dinner wagons, which will solve some of the serving problems. Dishes of food arranged on a trestle table or dinner wagons for buffet service should be conveniently placed so that the guests may serve themselves, and sufficient food must be allowed for the guests to satisfy their appetites and not leave the supper table bare.

Heating Savouries

Hot savouries are not a necessity, but are desirable if an electric oven is available in the hall. While the oven is heating to very hot (450 degrees F.) set the prepared sausage rolls, patties, savoury puffs, and small pies on the slides, of which about four will be needed.

Turn both oven elements to low and place one slide near the top element and one near the bottom element. Reverse these two trays after 10 minutes so that the savouries are heated on each side for 10 minutes. After a total of 20 minutes' heating place the first two slides in the middle of the oven and begin heating two more slides of savouries in the same way.

The hot savouries are placed on plates, garnished with parsley, and served at the beginning of supper or during the first 10 minutes.

Serving the Food

The supper may be served in one of three ways:—

On dinner wagons, which may have all the food and the serving dishes placed on them well in advance and be wheeled to various parts of the hall for the guests to serve themselves.

In a supper room to which the guests may adjourn at supper time; the table may have all the food and the serving dishes placed on it well in advance.

Buffet style in the hall, the food and serving dishes being set out in advance and placed ready to be transferred quickly to a trestle table erected in the hall at supper time from which guests may serve themselves.

Tea or coffee cups may be served from trays during supper.

The serving of the food and the dish washing may be done by experienced help, but the hostess will find many willing hands to assist her if she wishes.

Recipes for Buffet Menu

Fowl in Lettuce

8 fowls or chickens
8 medium-sized onions
½lb. of bacon end
4 dessertspoons of salt
10 medium-sized lettuces

Kill and clean the fowls 2 days before the party dance.

Peel the onions and cut the bacon end into 8 pieces. Wash the fowls well and place a piece of the bacon end and one onion in each. Place two of the fowls in a large pot with sufficient boiling water to cover them and add 1 dessertspoon of salt. Bring the water to the boil, then reduce the heat to simmer the birds gently until the meat is quite tender (2 to 3 hours). Cook the remainder of the fowls in the same way.

On the day of the party dance make a pint of mayonnaise dressing. Wash the lettuces. Remove the onion and bacon from the fowls, cut the birds into small pieces, and place the pieces in separate lettuce leaves. Shake pepper and salt on the prepared fowl and dab mayonnaise on some of the lettuce leaves. Arrange the food on plates and garnish it with tomato and parsley.

Crayfish in Lettuce

On the day of the party dance prepare the crayfish by placing each on its back and cutting it into halves lengthwise with a sharp knife. Remove the white meat, break it into pieces, and put them into separate lettuce leaves. Shake pepper and salt on the prepared crayfish and dab mayonnaise on some of the lettuce leaves. Arrange the food on plates and use the crayfish legs as a garnish with parsley.

Fruit Salad

Use 10 30oz. tins of fruit or the equivalent and 2 small bottles of passion fruit pulp; 3lb. of bananas may be substituted for 1 tin of the fruit.

Cut the fruit into small pieces and mix them all together thoroughly. Remove the surplus fruit juice, which is used in the trifles. Put the fruit salad in a glass or earthenware container overnight to allow the full flavour of the fruit to develop. Transport the fruit salad in the container to the hall and fill 8 fruit salad bowls.

A few hours before the supper is served peel and slice the bananas into the fruit salad and decorate it with the passion fruit pulp.

Trifles

6lb. of trifle sponge
Surplus fruit juice from the fruit salad
8 tablespoons of jam
2 quarts of warm custard
1 pint of wine
Ginger ale to supplement the fruit juice
1 pint of chopped jelly

Break the sponge into pieces and place equal quantities in 8 trifle dishes. Pour fruit juice or ginger ale over the sponge until it is wet but still retains its shape. Pour equal quantities of wine into the 8 dishes. Spread a tablespoon of jam on top of the sponge in each dish. Cover each dish with a layer of the warm custard and leave it to set. A few hours before the supper is served spread each trifle with whipped cream and garnish it with chopped jelly.

Moulded Jellies

Mix jellies according to the directions on the packets. Pour the liquid into aluminium moulds and leave it to set.

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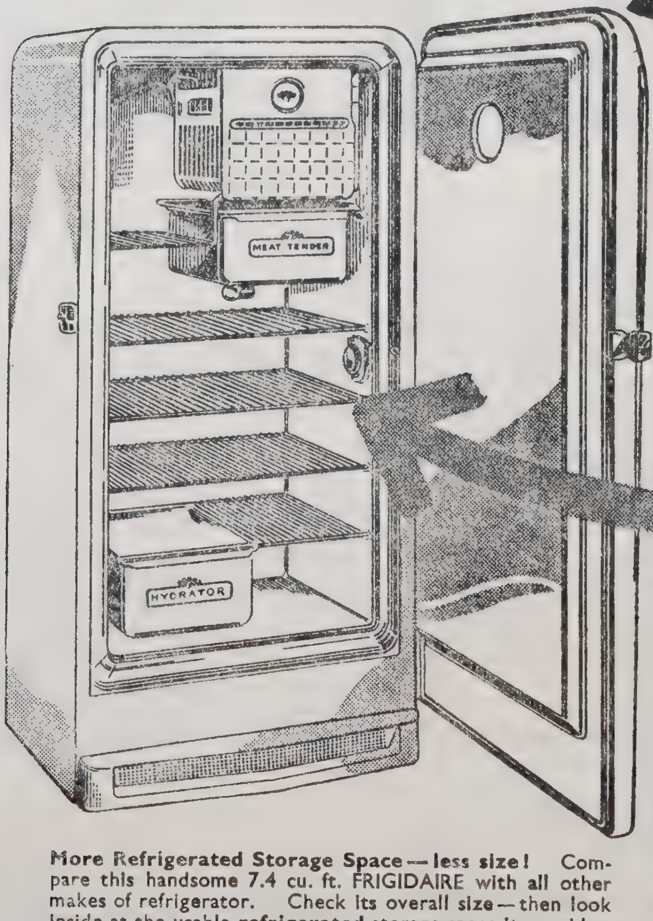

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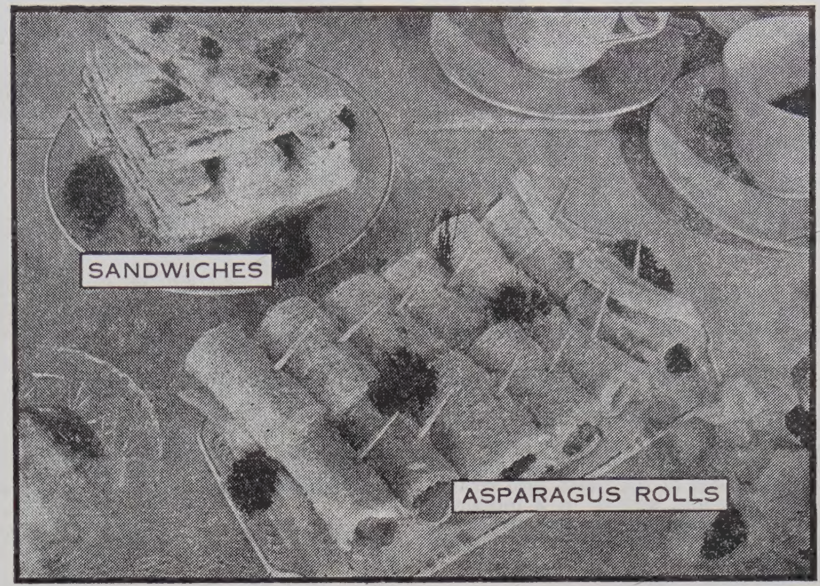
Sandwiches and Asparagus Rolls

1½ long sandwich loaves (4lb. loaves)
1½lb. of butter
Sandwich fillings
2 dozen fresh asparagus spears or 1 tin of asparagus spears

Slice the bread thinly and butter the slices. Reserve 2 dozen slices for the asparagus rolls.

Make sandwiches with the remainder of the bread, using a variety of sandwich fillings. Cut the crust from the sandwiches and cut the sandwiches (4 to every 2 slices of bread) into oblongs or triangles. Arrange the sandwiches on plates and garnish them with parsley.

Shake pepper and salt on the asparagus spears and remove all the crusts from the 2 dozen slices of bread. Roll each asparagus spear in a slice of bread, cut the roll into halves, and secure each small roll with a toothpick. Place them on plates and garnish them with parsley.



UNMOULDING JELLIES

Celery Boats

1 large head of celery
2 cups of dry mashed potato
1 tablespoon of Worcestershire sauce
1 tablespoon of chopped chives
1 tablespoon of mayonnaise
1 teaspoon of curry powder
Pepper and salt to taste

Wash and dry the celery. Mix the other ingredients to make a filling. Fill the hollows of the celery stalks with the filling and cut the stalks into 2in. lengths. Garnish each piece with a small piece of tomato. Place the celery boats on plates and garnish them with pieces of celery leaves.

Savoury Eggs

20 eggs (at least 2 days old)
2 lettuces
2 tablespoons of mayonnaise
1 teaspoon of curry powder
Pepper and salt to taste

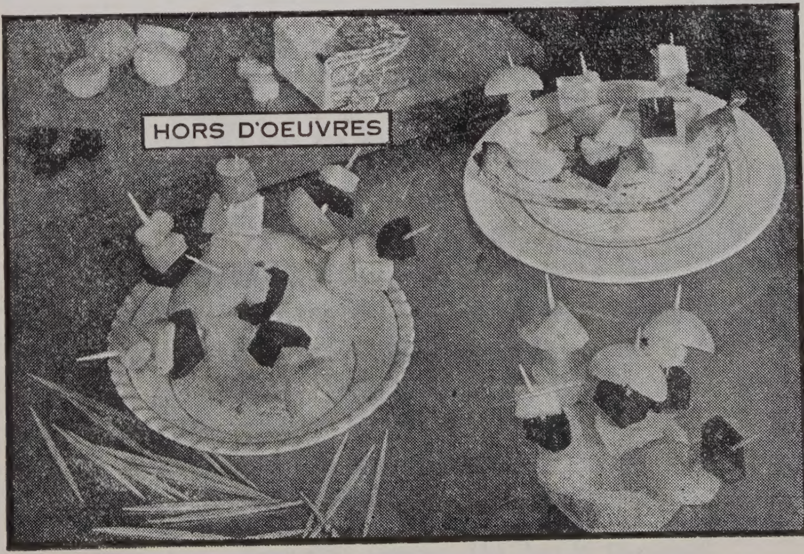
Boil the eggs for 15 minutes. Pour off the boiling water and cover the eggs with cold water. When the eggs have cooled a little tap the shells gently and roll each egg between the palms of the hands. Peel off the cracked shells.

Cut the eggs into halves and remove the yolks. Mash the egg yolks, moisten them with mayonnaise, and mix in the remainder of the ingredients. Refill the whites with the egg-yolk mixture. Place each half egg in a lettuce leaf and garnish each with a small piece of tomato.

Hors d'Oeuvres

1 tin of pineapple pieces
1 cooked beetroot cut into cubes
½lb. of pickled onions cut into halves
7 dozen toothpicks
½lb. of cheese cut into cubes
8 fruits (oranges, lemons, tree tomatoes, or bananas)

Push the pieces of pineapple, beetroot, pickled onion, and cheese on to toothpicks so that each toothpick holds three different pieces. Push these toothpick hors d'oeuvres into the fruits. If lemons or tree tomatoes are used, 4 extra toothpicks may form legs for each fruit to stand on. Space the fruits throughout the table for decoration.



Cheese and Bacon Canapes

6 thin slices of stale bread
3 tablespoons of grated cheese
1 rasher of streaky bacon

Spread the bread thinly with butter, remove all crusts, and cut each slice into four. Sprinkle each square of bread with grated cheese and garnish it with a piece of bacon. Bake the canapes in a hot oven (400 degrees F.) until they are golden brown.

Cheese Straws

1 cup of flour
2oz. of butter
2oz. of grated cheese
½ teaspoon of salt
Pinch of cayenne pepper
½ teaspoon of baking powder

Rub the butter into the flour. Add the grated cheese and then the other dry ingredients. Mix all to a firm paste with a little milk. Roll out the paste very thinly and prick it well with a fork. Cut out 8 rings and cut the remainder of the paste into straws. Bake rings and straws in a moderate oven (350 degrees F.) for 8 to 10 minutes. Serve the straws in bundles in the rings.

Savoury Puffs

3oz of butter
1 cup of water
5oz. of flour
4 eggs

Bring the water and butter to the boil. Add the sifted flour all at once to the boiling liquid and beat the mixture until it is thoroughly blended and leaves the sides of the pot. Leave it to cool for 5 minutes. Add the eggs one at a time, beating after each egg until the mixture is shiny. Put teaspoonfuls of the mixture on a cold greased tray. Bake the puffs for ½ hour in a hot oven (400 degrees F.), reducing the heat while they are baking. Before serving the puffs fill them with a savoury filling and garnish them with parsley.

Pastry Savouries

Three pounds of fat made into puff pastry is sufficient for all the pastry savouries. The sausage rolls require 4lb. of raw sausage meat and the pies 1½lb. of mince, seasoned, cooked, and thickened.

CHEESE AND BACON CANAPES

Sausage rolls: Roll half of the pastry ¼in. thick and cut it into strips 3in. wide. Moisten each strip along one side. Roll the sausage meat to the same length as the pastry strips and to the required thickness. Roll the pastry strips over the sausage filling and cut the rolls into 2in. lengths. Bake them in a very hot oven (500 degrees F.) for 25 minutes.

Patties: Cut patty cases from pastry rolled ⅓in. thick and bake them in a very hot oven (500 degrees F.) for 20 minutes. Fill the cases with a savoury filling and garnish them with parsley.

Small pies: From pastry rolled ¼in. thick cut 3 dozen rounds to fit patty pans and 3 dozen smaller rounds for the tops of the pies. Fill each pie with a teaspoon of the mince. Surplus mince can be used to fill the patty cases. Bake the pies in a very hot oven (500 degrees F.) for 25 minutes.

Sponge Lilies and Angels

2 eggs
½ cup of sugar
¾ cup of flour
1 teaspoon of cream of tartar
½ teaspoon of baking soda
Pinch of salt
1 dozen unfilled meringues

Beat the sugar and eggs until they are thick and foamy. Add the remainder of the ingredients sifted together. Put the mixture on a cold greased slide in teaspoonfuls and bake them for 5 minutes in a hot oven (400 degrees F.).

Put only 6 lilies at a time on the oven slide. While they are still hot after being baked lift the lilies off the slide with a knife and roll them into lily shape. Place them under a cake rack until they are set in shape. Fill them with cream, decorate them with jelly, and sprinkle them with icing sugar.

Angels are made from the same mixture but are slightly smaller and not rolled into lily shape. Put one sponge and half a meringue together with cream and sprinkle them with icing sugar.

Butterflies

2 eggs
4oz. of sugar
3oz. of flour
1oz. of cornflour
1 teaspoon of baking powder
Pinch of salt

Beat the eggs for 5 minutes. Add the sugar a tablespoonful at a time and beat the mixture for 15 minutes or until it is creamy. Mix in 2 tablespoons of cold water. Add the dry ingredients and fold them lightly into the mixture. Put teaspoonfuls in patty pans and bake them in a hot oven (400 degrees F.) for 8 minutes.

Jam Tarts

2 cups of flour
1½ teaspoons of baking powder
1 small cup of sugar
7oz. of butter
Essence of lemon
Jam

Rub the butter and sugar into the flour and baking powder. Mix them with a little milk to a stiff paste. Roll the paste to ¼in. thickness and cut out rounds to line patty pans. Put a teaspoonful of jam in each tart and bake the tarts in a moderate oven (350 degrees F.) for 20 minutes.

Jam tarts may be decorated with whipped cream before being served.

SAVOURY PATTIES
SMALL PIES
SAUSAGE ROLLS

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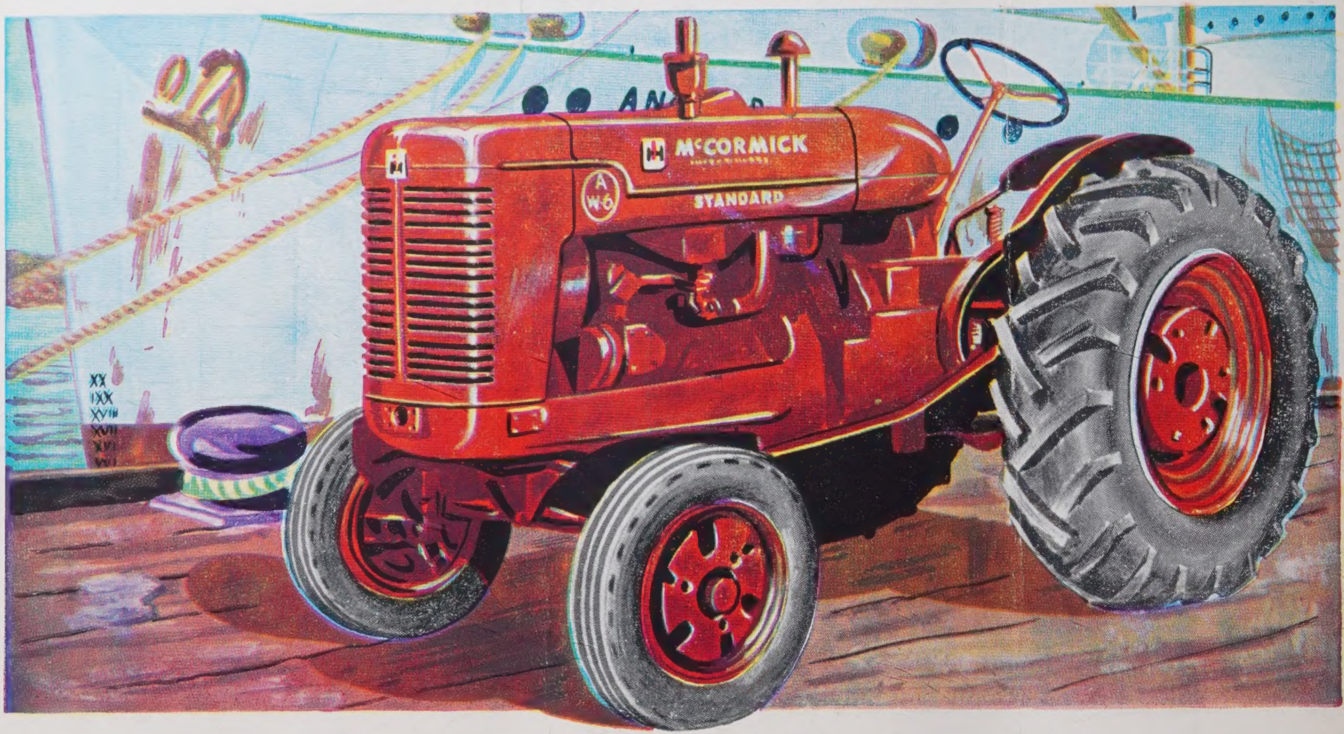

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